

SRI RAMAKRISHNA MISSION VIDYALAYA
POLYTECHNIC COLLEGE
(AN AUTONOMOUS & ISO 9001:2008 CERTIFIED INSTITUTION)

CURRICULUM AND SYLLABUS

(APPLICABLE TO STUDENTS ADMITTED FROM
2016 - 2017 ACADEMIC YEAR ONWARDS)
(R5 – SCHEME)

DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING
(SECOND AND THIRD YEAR)



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R5 - SCHEME : R E G U L A T I O N S

(For Second Year and Third Year)

Description of the Course:

The Course for the Full Time Diploma in Engineering shall extend over a period of three academic years, consisting of 6 semesters. This Curriculum for the Diploma Course is applicable for the candidates admitted in first year from 2016-2017 academic year onwards.

Eligibility for the Award of Diploma:

No candidate shall be eligible for the Diploma unless he has undergone the prescribed course of study in this College for a period of not less than 3 academic years when joined in first year and two years if joined under lateral entry scheme in the second year and passed the prescribed examination. The minimum and maximum period for completion of Diploma course is as given below:

Diploma Course	Minimum Period	Maximum Period
Full Time Regular	3 Years	6 Years
Full Time(Lateral Entry)	2 Years	5 Years

Age Limit: No age limit

Curriculum and Subjects of Study:

The curriculum and subjects of study shall be in accordance with the syllabus prescribed from time to time, both in theory and practical subjects.

Examinations:

Autonomous Examinations in all subjects of all the semesters under the scheme of examinations will be conducted at the end of each semester. The internal assessment marks for all the subjects will be awarded on the basis of continuous internal assessment earned during the semester concerned. For each subject 25 marks are allotted for internal assessment and 75 marks are allotted for final external Autonomous examination.

Continuous Internal Assessment Marks:

A. FOR THEORY SUBJECTS:

The internal assessment marks for a total of 25 marks, which are to be distributed as follows:

a)	Subject Attendance	05 marks
b)	Assignments	05 marks
c)	Seminar	05 marks
d)	Continuous Assessment Tests	05 marks
e)	Model Examination	05 marks
	TOTAL	25 Marks

a) Subject Attendance

05 Marks

(Award of marks for subject attendance to each theory subject is as per the range given below)

80%	-	83%	}	1 Mark
84%	-	87%		2 Marks
88%	-	91%		3 Marks
92%	-	95%		4 Marks
96%	-	100%		5 Marks

b) Assignments

05 Marks

For each theory subject three assignments are to be given and the average marks scored is reduced to 05 marks.

c) The Material submitted as well as Seminar presentation

05 Marks

The students will be given topics either from the subjects (excluding the topics available in the syllabus) or general topics which will help to improve their grasping capacity as well as their capacity to express the subject in hand. The students will be allowed to prepare the material for the given topic using the library hour and they will be permitted to present the seminar (for the 3rd and 4th semesters, the students will be permitted to present the seminar as a group not exceeding six members and for the 5th and 6th semester students will present the seminar individually).

The concerned subject teacher will suggest topics and will evaluate the submitted materials and seminar presentation. (2.5 marks for the material submitted in writing and 2.5 marks for the seminar presentation). For each subject a minimum of two topics are given and the average marks scored is reduced to 05 marks.

d) Continuous Assessment Tests

05 Marks

Two Continuous Assessment Tests (CAT), each of 2 hours duration for a total of 50 marks, are conducted. The **average of these two test marks** is taken and the marks are reduced to 05.

e) Model Examination

05 Marks

Model Examination is conducted covering all the five units of 3 hours duration as per the end semester Autonomous examination question paper pattern for a total of 75 marks. The mark obtained is reduced to 05 Marks.

Test	Units	When to conduct	Marks	Duration
CAT - I	Unit - I & II	End of 6 th week	50	2 Hrs
CAT - II	Unit - III & IV	End of 12 th week	50	2 Hrs
Model Exam	Covering all the 5 Units (End Semester Exam question paper pattern)	End of 15 th week	75	3 Hrs

END SEMESTER AUTONOMOUS EXAMINATION - QUESTION PAPER PATTERN
(Question paper pattern common to all theory subjects unless it is specified)

PART A - (1 to 8)

Five Questions are to be answered out of **eight** questions for 2 marks each. (Question No. 8 will be the compulsory question and can be asked from any one of the units) (From each unit maximum of two 2 marks questions alone can be asked)

PART B - (9 to 16)

Five Questions are to be answered out of **eight** questions for 3 marks each. (Question No. 16 will be the compulsory question and can be asked from any one of the units) (From each unit maximum of two 3 marks questions alone can be asked)

PART C - (17 to 21)

Five Questions will be asked from each unit in the **either - or** pattern. Students have to answer all the five questions. Each question carries 10 marks. (Based on the discretion of the question setter, he/she can ask two five mark questions (with sub division A & sub division B) instead of one ten marks question, if required)

Any tables required, should be mentioned in the question paper like Steam table, IS Code Book, Steel table, Design Data Book, Mollier chart, Psychometric Chart etc.,

B. FOR PRACTICAL SUBJECTS:

The internal assessment mark for a total of 25 marks which are to be distributed as follows:-

a)	Practical Attendance	05 Marks
b)	Procedure / observation and tabulation / other practical related works	10 Marks
c)	Record writing	10 Marks
TOTAL		25 Marks

Award of marks for attendance to each practical subject is as per the range given below.

80%	-	83%	}	1 Mark
84%	-	87%		2 Marks
88%	-	91%		3 Marks
92%	-	95%		4 Marks
96%	-	100%		5 Marks

Note:

- All the Experiments / Exercises indicated in the syllabus should be completed and the same to be given for final Autonomous end semester examinations.
- The Record for every completed exercise should be submitted in the subsequent Practical classes and marks should be awarded for 20 for each exercise as per the above allocation.
- At the end of the semester, the average marks of all the exercises calculated for 20 marks and the marks awarded for attendance is added to arrive at the internal assessment. (20 + 5 = 25)
- The students have to submit duly signed bonafide record note books / files during the Exam.
- All the marks awarded for Assignments, Tests, Practical exercise marks and Attendance are entered in the Personal Log Book of the staff, who handles the subject. This is applicable to both, Theory and Practical subjects.

C. PROJECT WORK:

The students have to do a project work in the final semester as part of the Curriculum and in partial fulfillment for the award of Diploma by the State Board of Technical Education and Training. The project work must be reviewed twice in a semester.

i) Internal Assessment Marks:

The internal assessment should be calculated based on the review of the progress of the work done by the student periodically as follows.

Details of Assessment	Period of Assessment	Max. Marks
First Review	06 th week	10
Second Review	12 th week	10
Attendance (same as Theory / Practical)	Entire semester	05
Total		25

ii) End Semester Exam:

A neatly prepared PROJECT REPORT as per the format is submitted by individual student during the project work & viva-voce end semester examinations.

Details of mark allocation	Max. Marks
Report Preparation, Demo, Viva-voce	60 Marks
4 questions from question bank consisting of Entrepreneurship, Environmental Management and Disaster Management will be asked. Out of four questions the students have to write any two questions from each topic. 2 questions x 3 topics = 6 questions (6 x 2 ½ = 15 Marks)	15 Marks
Total	75 Marks

Award of Diploma:**Classification of successful candidates:**

Classification of candidates who will pass out the final examinations from April 2019 onwards (Joined in first year in 2016-2017 academic year) in R5-scheme is being done as specified below.

First Class with Superlative Distinction:

A candidate will be declared to have passed in **First Class with Superlative Distinction**, if he secures not less than 75% of the marks in all the subjects and passes all the semesters in the first appearance itself and passes all subjects within the stipulated period of study of 3 / 2 years (3 years for regular entry / 2 years for lateral entry) without any break.

First Class with Distinction:

A candidate will be declared to have passed in **First Class with Distinction**, if he secures not less than 75% of the aggregate marks in all the semesters put together and passes all the semesters except the I and II semester in the first appearance itself and passes all subjects within the stipulated period of study of 3 / 2 years (3 years for regular entry 2 years for lateral entry) without any break.

First Class:

A candidate will be declared to have passed in **First Class**, if he secures not less than 60% of the aggregate marks in all the semesters put together and passes all the subjects within the stipulated period of study 3 / 2 years (3 years for regular entry / 2 years for lateral entry) without any break.

Second Class:

All other successful candidates will be declared as pass in ***Second Class***.

Criteria for Pass:

1. No candidate shall be eligible for the award of Diploma unless he has undergone the prescribed course of study successfully and pass all the subjects prescribed in the curriculum.
2. A candidate shall be declared to have passed the examination in a subject if he secures not less than 40% in theory subjects and 50% in practical subjects out of the total prescribed maximum marks including both the Internal Assessment and the End semester Examinations marks put together, subject to the condition that he secures at least a minimum of 30 marks out of 75 marks in the Theory Examinations and a minimum of 35 marks out of 75 marks in the Practical Examinations.

Duration of a period in the Class Time Table:

The duration of each period of instruction is 01 hour and the total period of instruction hours excluding interval and lunch break in a day should be 07 hours corresponding to 07 periods of instruction (Theory & Practical).

Autonomous Examination - Exam Pattern:

Autonomous Examinations for all the Diploma Courses are being conducted in the following Pattern:

Semester	Span of Study	Examination
I, III & V Sem	June - October	October
II, IV & VI Sem	December - April	April

Requirements to appear for Examinations:

A candidate will be permitted to appear for the Autonomous examinations, only if he secures a minimum of overall 80% attendance in the semester concerned.

Condonation of Attendance:

The minimum overall percentage of attendance required for a candidate to become eligible to write the Autonomous end semester examination is 80%. Under extraordinary circumstances, for genuine and valid reasons, Medical reasons, the Principal may condone up to a maximum of 10% shortage to a candidate, subject to the condition that he satisfies all the other requirements to appear for the Autonomous Examination. Under no circumstances a candidate with attendance less than 70% shall be permitted to write the Autonomous Examinations. The condonement of 10% shortage shall not be done as a routine to all candidates, but only for genuine cases; it shall not be claimed as a matter of right by all candidates.

DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING CURRICULUM OUTLINE

THIRD SEMESTER:

Subject Code	Name of Subject	Hours per week		
		Theory	Practical	Total
R5-331	Electrical Circuit Theory	6	-	6
R5-332	Electrical Machines - I	5	-	5
R5-333	Electronic Devices and Circuits	5	-	5
R5-334	Electrical circuits Practical	-	4	4
R5-335	Electrical Machines - I Practical	-	5	5
R5-336	Electronic Devices and Circuits Practical	-	5	5
R5-337	Computer Applications Practical	-	4	4
Library cum Seminar		1	-	1
TOTAL		17	18	35

FOURTH SEMESTER:

Subject Code	Name of Subject	Hours per week		
		Theory	Practical	Total
R5-431	Electrical Machines - II	5	-	5
R5-432	Measurement and Instrumentation	5	-	5
R5-433	Digital Electronics	5	-	5
R5-434	Linear Integrated Circuits	5	-	5
R5-435	Electrical Machines - II and Instrumentation Practical	-	5	5
R5-436	Digital Electronics and Linear Integrated Circuits Practical	-	5	5
R5-437	Life and Employability Skills Practical	-	4	4
Library cum Seminar		1	-	1
TOTAL		21	14	35

FIFTH SEMESTER:

Subject Code	Name of Subject	Hours per week		
		Theory	Practical	Total
R5-531	Generation, Transmission and Switchgear	5	-	5
R5-532	Microprocessor and Microcontroller	5	-	5
R5-533	Programmable Logic Controller	5	-	5
R5-534.1	Elective Theory - I: Communication Engineering	5	-	5
R5-534.2	Elective Theory - I: VLSI Design			
R5-534.3	Elective Theory - I: Electrical Machine Design			
R5-535	Microcontroller Practical	-	5	5
R5-536	Programmable Logic Controller Practical	-	5	5
R5-537	Simulation Practical - I	-	4	4
Library cum Seminar		1	-	1
TOTAL		21	14	35

SIXTH SEMESTER:

Subject Code	Name of Subject	Hours per week		
		Theory	Practical	Total
R5-631	Distribution, Utilisation and Electrical Estimation	5	-	5
R5-632	Power Electronics and Drives	6	-	6
R5-633.1	Elective Theory - II: Medical Electronics	5	-	5
R5-633.2	Elective Theory - II: Maintenance of Electrical Equipments			
R5-633.3	Elective Theory - II: Computer Hardware and Networking			
R5-634	Electrical Workshop Practical	-	5	5
R5-635	Power Electronics and Drives Practical	-	5	5
R5-636	Simulation Practical - II	-	4	4
R5-637	Project Work	-	4	4
Library cum Seminar		1	-	1
TOTAL		17	18	35

ANNEXURE - II: SCHEME OF EXAMINATIONS

Subject Code	Name of Subject	Periods Per Week	Periods per Semester (15 weeks)	Scheme of Examination				
				Exam Duration in Hrs	Allocation of Marks			Minimum for Pass
					Internal	External	Total	
THIRD SEMESTER								
R5-331	Electrical Circuit Theory	6	90	3	25	75	100	40
R5-332	Electrical Machines - I	5	75	3	25	75	100	40
R5-333	Electronic Devices and Circuits	5	75	3	25	75	100	40
R5-334	Electrical circuits Practical	4	60	3	25	75	100	50
R5-335	Electrical Machines - I Practical	5	75	3	25	75	100	50
R5-336	Electronic Devices and Circuits Practical	5	75	3	25	75	100	50
R5-337	Computer Applications Practical	4	60	3	25	75	100	50
FOURTH SEMESTER								
R5-431	Electrical Machines - II	5	75	3	25	75	100	40
R5-432	Measurements and Instruments	5	75	3	25	75	100	40
R5-433	Digital Electronics	5	75	3	25	75	100	40
R5-434	Linear Integrated Circuits	5	75	3	25	75	100	40
R5-435	Electrical Machines - II and Instrumentation Practical	5	75	3	25	75	100	50
R5-436	Digital Electronics and Linear Integrated Circuits Practical	5	75	3	25	75	100	50
R5-437	Life and Employability Skills Practical	4	60	3	25	75	100	50

Subject Code	Name of Subject	Periods Per Week	Periods per Semester (15 weeks)	Scheme of Examination				Minimum for Pass
				Exam Duration in Hrs	Allocation of Marks			
					Internal	External	Total	
FIFTH SEMESTER								
R5-531	Generation, Transmission and Switchgear	5	75	3	25	75	100	40
R5-532	Microprocessor and Microcontroller	5	75	3	25	75	100	40
R5-533	Programmable Logic Controller	5	75	3	25	75	100	40
R5-534.1	Elective Theory - I: Communication Engineering	5	75	3	25	75	100	40
R5-534.2	Elective Theory - I: VLSI Design							
R5-534.3	Elective Theory - I: Electrical Machine Design							
R5-535	Microcontroller Practical	5	75	3	25	75	100	50
R5-536	Programmable Logic Controller Practical	5	75	3	25	75	100	50
R5-537	Simulation Practical - I	4	60	3	25	75	100	50
SIXTH SEMESTER								
R5-631	Distribution, Utilisation and Electrical Estimation	5	75	3	25	75	100	40
R5-632	Power Electronics and Drives	6	90	3	25	75	100	40
R5-633.1	Elective Theory - II: Bio-Medical Instrumentation	5	75	3	25	75	100	40
R5-633.2	Elective Theory - II: Maintenance of Electrical Equipments							
R5-633.3	Elective Theory - II: Computer Hardware and Networking							
R5-634	Electrical Workshop Practical	5	75	3	25	75	100	50
R5-635	Power Electronics and Drives Practical	5	75	3	25	75	100	50
R5-636	Simulation Practical - II	4	60	3	25	75	100	50
R5-637	Project Work	4	60	3	25	75	100	50

R5-SCHEME GENERAL EVALUATION PATTERN (THEORY)

External Examination	-	075 marks
Internal Assessment	-	025 marks
Total	-	100 marks

Condition for pass:

1. In external exam minimum **30** out of **75** marks
2. In internal there is **no** minimum
3. Internal + External must be **40** percent for pass.

Evaluation of Internal Assessment Marks:

The Internal Assessment marks for a total of 25 marks which are distributed as follows:-

a)	Subject Attendance	05 marks
b)	Assignments	05 marks
c)	Seminar	05 marks
d)	Continuous Assessment Tests	05 marks
e)	Model Examination	05 marks
	TOTAL	25 Marks

a) Subject Attendance

05 Marks

(Award of marks for subject attendance to each Theory subject is as per the range given below)

80%	-	83%	}	1 Mark
84%	-	87%		2 Marks
88%	-	91%		3 Marks
92%	-	95%		4 Marks
96%	-	100%		5 Marks

b) Assignments

05 Marks

For each theory subject three assignments are to be given and the average marks scored is reduced to 05 marks.

c) The Material submitted as well as Seminar presentation

05 Marks

The students will be given topics either from the subjects (excluding the topics available in the syllabus) or general topics which will help to improve their grasping capacity as well as their capacity to express the subject in hand. The students will be allowed to prepare the material for the given topic using the library hour and they will be permitted to present the seminar (for the 3rd and 4th semesters, the students will be permitted to present the seminar as a group not exceeding six members and for the 5th and 6th semester students will present the seminar individually).

The concerned subject teacher will suggest topics and will evaluate the submitted materials and seminar presentation. (2.5 marks for the material submitted in writing and 2.5 marks for the seminar presentation). For each subject a minimum of two topics are given and the average marks scored is reduced to 05 marks.

d) Continuous Assessment Tests

05 Marks

Two Continuous Assessment Tests (CAT), each of 2 hours duration for a total of 50 marks, are conducted. The **average of these two test marks** is taken and the marks are reduced to 05.

e) Model Examination

05 Marks

Model Examination is conducted covering all the five units of 3 hours duration as per the End Semester Autonomous Examination question paper pattern for a total of 75 marks. The mark obtained is reduced to 5 Marks.

Test	Units	When to conduct	Marks	Duration
CAT-I	Unit - I & II	End of 6 th week	50	2 Hrs
CAT-II	Unit - III & IV	End of 12 th week	50	2 Hrs
Model Exam	Covering all the 5 Units. (End Semester Exam question paper pattern)	End of 15 th week	75	3 Hrs

END SEMESTER AUTONOMOUS EXAMINATION - QUESTION PAPER PATTERN

(Question paper pattern common to all theory subjects unless it is specified)

PART A - (1 to 8)

Five Questions are to be answered out of **eight** questions for 2 marks each. (Question No. 8 will be the compulsory question and can be asked from any one of the units) (From each unit maximum of two 2 marks questions alone can be asked)

PART B - (9 to 16)

Five Questions are to be answered out of **eight** questions for 3 marks each. (Question No. 16 will be the compulsory question and can be asked from any one of the units) (From each unit maximum of two 3 marks questions alone can be asked)

PART C - (17 to 21)

Five Questions will be asked from each unit in the **EITHER - OR** pattern. Students have to answer all the five questions. Each question carries 10 marks. (Based on the discretion of the question setter, he/she can ask two five mark questions (with sub division A & sub division B) instead of one ten marks question, if required)

* Any tables required, should be mentioned in the question paper like Code book, Hand book etc.,

R5-SCHEME GENERAL EVALUATION PATTERN (PRACTICAL)

External Examination	-	075 marks
Internal Assessment	-	025 marks
Total	-	100 marks

Condition for pass:

1. In external practical exam minimum **35** out of **75** marks
2. In internal there is **no** minimum
3. Internal + External must be **50** percent for pass.

Evaluation of Internal Assessment Marks:

The Internal Assessment marks for a total of 25 marks which are to be distributed as follows:-

a) Practical Attendance	05 Marks
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b)	Procedure / observation and tabulation / other practical related works	10 Marks
c)	Record writing	10 Marks
	TOTAL	25 Marks

Award of marks for attendance to each practical subject is as per the range given below.

80%	-	83%	}	1 Mark
84%	-	87%		2 Marks
88%	-	91%		3 Marks
92%	-	95%		4 Marks
96%	-	100%		5 Marks

Note:

- All the Experiments / Exercises indicated in the syllabus should be completed and the same to be given for final Autonomous end semester examinations.
- The Record for every completed exercise should be submitted in the subsequent Practical classes and marks should be awarded for 20 for each exercise as per the above allocation.
- At the end of the semester, the average marks of all the exercises calculated for 20 marks and the marks awarded for attendance is added to arrive at the internal assessment. (20 + 5 = 25)
- The students have to submit duly signed bonafide record note books / files during the Exam.
- All the marks awarded for Assignments, Tests, Practical exercise marks and Attendance are entered in the Personal Log Book of the staff, who handles the subject. This is applicable to both, Theory and Practical subjects.

Project Work:

The students have to do a project work in the final semester as part of the Curriculum and in partial fulfillment for the award of Diploma by the State Board of Technical Education and Training. The project work must be reviewed twice in a semester.

a) Internal Assessment:

The internal assessment should be calculated based on the review of the progress of the work done by the student periodically as follows.

Details of Assessment	Period of Assessment	Max. Marks
First Review	06 th week	10
Second Review	12 th week	10
Attendance (same as Theory / Practical)	Entire semester	05
	Total	25

b) End Semester Exam:

A neatly prepared PROJECT REPORT as per the format is submitted by individual student during the project work & viva-voce end semester examinations.

Details of mark allocation	Max. Marks
Report Preparation, Demo, Viva-voce	60 Marks
4 questions from question bank consisting of Entrepreneurship, Environmental Management and Disaster Management will be asked. Out of four questions the students have to write any two questions from each topic. 2 questions x 3 topics = 6 questions (6 x 2 ½ = 15 Marks)	15 Marks
Total	75 Marks

DETAILED SYLLABUS
THIRD SEMESTER
R5-331 ELECTRICAL CIRCUIT THEORY

SUBJECT	INSTRUCTIONS		EXAMINATION			
	Hours / Week	Hours / Sem	Marks			Duration
R5-331 ELECTRICAL CIRCUIT THEORY	6 Hrs	90 Hrs	Internal Assessment	External Exam	Total	
			25	75	100	

Topics and Allocation of Hours:

Unit No.	Topics	Hours
I	INTRODUCTION	16
II	ANALYSIS OF DC CIRCUITS AND NETWORK THEOREMS	16
III	SINGLE PHASE AC CIRCUIT	16
IV	THREE PHASE AC CIRCUIT	16
V	RESONANCE CIRCUITS	16
Total Instruction Hours		80

UNIT – I
INTRODUCTION

16 Hrs

Electric charge – electric current – electric field – potential difference – electric power – energy – active & passive elements – basic definitions: voltage & current sources – load dependence of the practical voltage source – ideal current source – practical current source – ideal voltage source connected in series – practical voltage source connected in series – ideal & practical current source connected in parallel – two practical current source connected in series – ideal voltage source connected in parallel – practical voltage source connected in parallel – linear & non-linear elements – lumped & distributed elements – bilateral & unilateral circuit elements – Kirchhoff's current and voltage laws – resistor in series and parallel – capacitor in series and parallel – problems in above topics

Transformations: Voltage source and current source transformations – star and delta transformations – simple problems

UNIT – II
ANALYSIS OF DC CIRCUITS AND NETWORK THEOREMS

16 Hrs

Analysis of DC circuits: Mesh current analysis method – steps and problems – nodal analysis method – steps and problems

Network Theorems: Introduction – Thevenin's theorem – Norton's theorem – Superposition theorem and maximum power transfer theorem – simple problems

UNIT – III
SINGLE PHASE AC CIRCUIT

16 Hrs

‘J’ Operator – rectangular and polar co-ordinates – sinusoidal voltage and current – instantaneous, peak, average and effective values – form factor and peak factor (derivations for sine wave) – pure resistive, inductive and capacitive circuits – RL, RC, RLC series circuits – impedance – phase angle – phasor diagram – power and power factor – power triangle – apparent power, active and reactive power – parallel circuits (two branches only) – conductance, susceptance and admittance – problems on all the above topics.

**UNIT – IV
THREE PHASE AC CIRCUITS**

16 Hrs

Importance of 3 phase circuits – star, delta connections – phase sequence – balanced load – relation between voltages, currents of line and phase values in star and delta connection – problems in balanced loads of star and delta connections – measurement of 3 phase power using two wattmeter method (derivation and problems) – effects of unbalanced loads in star and delta systems

**UNIT – V
RESONANCE CIRCUITS**

16 Hrs

Resonance – series resonance – effects of varying Inductance and capacitance in series RLC circuit – selectivity – Q-factor – resonance frequency – bandwidth – half power frequency – parallel resonance – two branch parallel circuits, resonant frequency – bandwidth problems.

Text Books:

1. Electric Circuit Theory, Dr.M.Arumugam Dr.N.Premkumaran, Khanna Publishers, New Delhi
2. Electric Circuits Joseph Edminister Schaum Series

Reference Books:

1. Circuits and Networks Analysis and Synthesis. A. Sudhakar Shyammoan S Palli Tata McGraw Hill Education Private Ltd.,
2. Electric Circuits Mahamood Nahvi Joseph A Edminister Tata McGraw Hill Education Private Ltd.,

Instruction Hours	80 Hours
Continuous Assessment Test 1, Test 2 & Model Examination	07 Hours
Revision / Assignments / Discussions	03 Hours
Total	90 Hours

* Pattern of the Question paper (Internal and External) - General Pattern (Theory)

R5-332 ELECTRICAL MACHINES - I

SUBJECT	INSTRUCTIONS		EXAMINATION			Duration
	Hours / Week	Hours / Sem	Marks			
R5-332 ELECTRICAL MACHINES - I	5 Hrs	75 Hrs	Internal Assessment	External Exam	Total	3 Hrs
			25	75	100	

Topics and Allocation of Hours:

Unit No.	Topics	Hours
I	ELECTROMAGNETISM AND DC GENERATORS	13
II	DC MOTORS	13
III	TRANSFORMERS	13
IV	MAINTENANCE OF DC MACHINES	13
V	OPERATION & MAINTENANCE OF TRANSFORMER	13
Total Instruction Hours		65

UNIT – I
ELECTROMAGNETISM AND DC GENERATORS

13 Hrs

Electromagnetism: Magnetic materials – permanent and electro magnets – applications – basic electromagnetic laws – Maxwell's Cork Screw Rule – magnetic quantities (flux, flux density, MMF, reluctance, magnetizing force, permeability, relative permeability) Faraday's laws of electromagnetic induction

DC Generators: Principle of operation – constructional details – types of DC generators – EMF equation (simple problems) – lap and wave winding (no winding diagram) – different types of excitation – no load characteristics of self excited (shunt & compound) generators – load characteristics of self excited (series, shunt & compound) generators – critical resistance – conditions for self excitation – armature reaction – commutation – causes of voltage drop – losses (hysteresis and eddy current losses) – efficiency – electrical efficiency – maximum efficiency – problems – applications of DC Generators

UNIT – II
DC MOTORS

13 Hrs

Principle of operation – torque, back EMF & speed equations (simple problems) – classification – characteristics of shunt, series & compound motors – applications – speed control – field control and armature control – necessity of starter – 3 point starter, 4 point starter – losses and efficiency – testing (load test & Swinburne's test) – simple problems.

UNIT – III
TRANSFORMERS

13 Hrs

Transformer – principle of operation – construction – EMF equation – voltage ratio – simple problems. phasor diagram of transformers on no load & load (lagging p.f., leading p.f., & UPF) – equivalent circuit – voltage regulation (simple problems) – losses & efficiency – OC & SC tests – condition for maximum efficiency (simple problems) – all day efficiency (simple problems) – principle of auto transformer – applications. Three phase transformers – different connections – parallel operations – load sharing – conditions for parallel operation – cooling methods – protective devices & accessories (Conservator, Breather, Buch-Holz relay & Explosion vent) – necessity of tap changers – on load & off load tap changers – Scott connection – tertiary winding (no problems)

UNIT – IV

MAINTENANCE OF DC MACHINES**13 Hrs**

Causes of sparking in commutator – defects in commutator and remedies, under cutting mica – resurfacing of commutator – brushes – functions and requirements – brush holder – function and different types – staggering of brushes – brush pressure – defect in DC armature winding – growler

UNIT – V**OPERATION & MAINTENANCE OF TRANSFORMER****13 Hrs**

Forces generated in transformer during short circuit – noise in operation – reason for temperature rise – insulation resistance – drying out – precaution for paralleling transformer – inrush current and remedy – insulation co-ordination – effect on insulation during star point earthing – transformer maintenance schedule – action to be taken while transformer oil, temperature rises unduly – points to be checked by oil level tends to fall down – attention required for bushing and insulator.

Text Books:

1. A Text Book of Electrical Technology Volume II by B.L. Theraja, S.Chand & Co. New Delhi.
2. Electrical machines by K.Bhattacharya (Principal, TTTI, Chandigarh), Tata McGraw Hill Publishing Company, New Delhi

Reference Books:

1. A course of Electrical Engineering by B.L. Theraja, S.Chand and Co., New Delhi
2. A course in Electrical Technology (Vol-2) Operation and Maintenance of Electrical Machines by B.V.S. Rao, Khanna Publishers, New Delhi

Instruction Hours	65 Hours
Continuous Assessment Test 1, Test 2 & Model Examination	07 Hours
Revision / Assignments / Discussions	03 Hours
Total	75 Hours

* Pattern of the Question paper (Internal and External) - General Pattern (Theory)

R5-333 ELECTRONIC DEVICES AND CIRCUITS

SUBJECT	INSTRUCTIONS		EXAMINATION			Duration
	Hours / Week	Hours / Sem	Marks			
R5-333 ELECTRONIC DEVICES AND CIRCUITS	5 Hrs	75 Hrs	Internal Assessment	External Exam	Total	3 Hrs
			25	75	100	

Topics and Allocation of Hours:

Unit No.	Topics	Hours
I	SEMICONDUCTOR DEVICES AND RECTIFIERS	13
II	TRANSISTOR, FET & UJT	13

III	OSCILLATOR & AMPLIFIERS	13
IV	SCR– DIAC–TRIAC–MOSFET–IGBT	13
V	OPTO ELECTRONIC DEVICES AND WAVE SHAPING CIRCUITS	13
Total Instruction Hours		65

UNIT - I**SEMICONDUCTOR DEVICES AND RECTIFIERS****13 Hrs**

Semiconductor: Definition and classification – intrinsic and extrinsic semiconductors – N type and P type. Diodes – PN Junction diodes – forward and reverse biasing – diode specification and its applications – zener diode – Avalanche breakdown and zener breakdown – specification and its application – zener diode as a voltage regulator – Varactor diode – power diodes and its classification – diode code number

Rectifiers: Introduction – classification – half wave – full wave & bridge rectifier construction, operation and its output waveforms with and without filters – efficiency calculations – application of rectifier – filters – C, L C, Pi filters

UNIT - II**TRANSISTOR, FET & UJT****13 Hrs**

Transistor: Classification – NPN, PNP –transistor biasing – fixed bias, collector base bias, self bias – common base, common emitter, and common collector configurations characteristics and its comparison in terms of input impedance, output impedance ,current gain, and voltage gain. Transistor used as an amplifier and switch

FET and UJT: FET – Classification – JFET Construction, working and its specification. UJT – construction, operation, characteristics and its application

UNIT - III**OSCILLATOR & AMPLIFIERS****13 Hrs**

Oscillator: Introduction – classification – condition for oscillation (Barkhausen criterion) LC oscillator – Hartley oscillator – Colpitts oscillator – RC Phase shift oscillator and crystal oscillator – Weinbridge oscillator – UJT used as a relaxation oscillator – function generator – introduction, function and its applications

Amplifiers: RC coupled amplifiers – load characteristics and emitter follower and feed back – FET used as an amplifier

UNIT - IV**SCR– DIAC–TRIAC–MOSFET–IGBT****13 Hrs**

SCR: Introduction and specifications construction, working and its applications – equivalent circuit of SCR – SCR used as a switch

DIAC: Construction, working and its characteristics – applications – Diac used as Bi-directional switch

TRIAC: Construction, operation, characteristic and its applications – speed control of fan motor using Diac and Triac

MOSFET: Construction, working, characteristics – MOSFET used as switch – CMOS technology – basic concept

IGBT: Construction and operation and its applications IGBT used as a switch

UNIT - V**OPTO ELECTRONIC DEVICES AND WAVE SHAPING CIRCUITS****13 Hrs**

LED – construction and its characteristics – types of LED – single colour LEDs, multicolor LEDs – LED sizes and shapes– seven segment display, LCD – comparison of LED and LCD.LDR – construction – working and its characteristics. Opto coupler and opto interrupter. – IR transmitter, receiver and its application. Laser Diode – solar cell – Avalanche photodiode and photo transistor
Diode clipper – clamper and its types – voltage doublers – astable, monostable and bistable multivibrator

Text Books:

1. Electronics Devices & Circuits by Salivahanan S, N.Suresh Kumar, A.Vallavaraj Tata McGraw Publication 3rd Edition 2016
2. Electronics Devices and circuit theory by Boyestad & Nashelsky, PHI , New Delhi 2009

Reference Books:

1. Electronics Devices Application and Integrated Circuits by Mathur, Kulshreshtha and Chadha Umesh Publications, New Delhi 6.
2. Principle of Electronics by V.K.Mehta.
3. Electronic devices and Circuits – An Introduction by Allen Mottershead, Prentice – Hall of India (P) Ltd,
4. Electronic Devices and Circuits by Jacob Millman and Halkies, Tata McGraw Hill Publishing Company, New Delhi

Instruction Hours	65 Hours
Continuous Assessment Test 1, Test 2 & Model Examination	07 Hours
Revision / Assignments / Discussions	03 Hours
Total	75 Hours

* Pattern of the Question paper (Internal and External) - General Pattern (Theory)

R5-334 ELECTRICAL CIRCUITS PRACTICAL

SUBJECT	INSTRUCTIONS		EXAMINATION			Duration
	Hours / Week	Hours / Sem	Marks			
R5-334 ELECTRICAL CIRCUITS PRACTICAL	4 Hrs	60 Hrs	Internal Assessment	External Exam	Total	3 Hrs
			25	75	100	

EXPERIMENTS IN CIRCUITS:

1. Verification of super position theorem with two different DC voltages.
2. Verification of Thevenin's theorem with a DC supply.
3. Measurement of power a) 3 Ammeter method b) 3 Voltmeter method.
4. Verification of maximum power transfer theorem.
5. Verification of Norton's theorem.
6. Verify the characteristics of A.C circuit having 'L' and 'C' in series.
7. Verify the characteristics of A.C circuit having 'L' and 'C' in parallel.
8. 3 phase power & power factor measurements using two wattmeter methods.

09. Verify the characteristics of pure resistive in A.C circuit.
10. Verify the characteristics of pure capacitive in A.C circuit.
11. To verify the characteristics of 3 phase balanced star connection.
12. To verify the characteristics of 3 phase balanced delta connection
13. To verify the characteristics of 3 phase unbalanced star system and measure neutral current.
14. To verify the characteristics of 3 phase unbalanced delta system
15. Measure power in RLC series circuit and calculate power and power factor

Examination Pattern:

Note: All the exercises have to be completed. Any one exercise will be given for examination. The students are allowed to select the question by lot. Record notebook should be submitted during the practical examination.

Sl. No	Allocation of Marks	Max. Marks
1	Circuit Diagram	20
2	Connection and Proceeding the Experiment	25
3	Reading / Calculation / Graph / Result	25
4	Viva-voce	05
TOTAL		75 Marks

Theory & practical exercises	50 Hours
Revision / Repetition	10 Hours
Total	60 Hours

R5-335 ELECTRICAL MACHINES PRACTICAL - I

SUBJECT	INSTRUCTIONS		EXAMINATION			
	Hours / Week	Hours / Sem	Marks			Duration
R5-335 ELECTRICAL MACHINES PRACTICAL- I	5 Hrs	75 Hrs	Internal Assessment	External Exam	Total	
			25	75	100	

Experiments:

1. OCC of separately excited DC shunt generator.
2. OCC of self – excited DC shunt generator.
3. Load test on DC shunt generator and estimate of regulation.
4. Load test on DC compound generator.
5. Load test on DC shunt motor.
6. Load test on DC series motor and plot the torque versus speed characteristics.
7. Load test on DC compound motor.
8. To regulate the speed of a shunt motor by (i) using field and armature control method .
9. Pre–determination the efficiency of DC machine by doing Swinburne’s test.
10. Loading of single phase transformer
11. Loading of Three phase transformer
12. Acidity test on transformer oil.

13. Load sharing of two single phase transformers.
14. Predetermination the efficiency of the single phase transformer by doing OC and SC tests.
15. Loading of single phase transformer and determination of regulation.

Examination Pattern:

Note: All the exercises have to be completed. Any one exercise will be given for examination. The students are allowed to select the question by lot. Record notebook should be submitted during the practical examination.

Sl. No	Allocation of Marks	Max. Marks
1	Circuit Diagram	20
2	Connection and Proceeding the Experiment	25
3	Reading / Calculation / Graph / Result	25
4	Viva-voce	05
TOTAL		75 Marks

Theory & practical exercises	60 Hours
Revision / Repetition	15 Hours
Total	75 Hours

R5-336 ELECTRONIC DEVICES AND CIRCUITS PRACTICAL

SUBJECT	INSTRUCTIONS		EXAMINATION			Duration
	Hours / Week	Hours / Sem	Marks			
R5-336 ELECTRONIC DEVICES AND CIRCUITS PRACTICAL	5 Hrs	75 Hrs	Internal Assessment	External Exam	Total	3 Hrs
			25	75	100	

Experiments:

- 1) Construct the VI characteristic of zener diode in both forward and reverse biasing.
- 2) Assemble the full wave rectifier circuit and trace the output waveforms with and without filter.
- 3) Assemble the bridge rectifier circuit and trace the output waveforms with and without filter.
- 4) Construct the transistor's common emitter configuration and plot its characteristics.
- 5) Operate the J FET for various gate voltages and find its characteristics.
- 6) Verify the characteristics of MOSFET.
- 7) Operate the UJT and find its Drain Characteristics.
- 8) Find out the Characteristics of SCR.
- 9) Connect the Diac and determine its Cut in voltage.
- 10) Connect the Triac and determine its gate current for different anode voltage
- 11) Find out the characteristic of LED and LDR.
- 12) Construct the diode clipper and clamper circuit and trace their output waveform.
- 13) Assemble the astable multivibrator.
- 14) Construct a RC phase shift oscillator and trace out the waveform.

- 15) Construct a RC coupled amplifier and trace out the waveform.

Examination Pattern:

Note: All the exercises have to be completed. Any one exercise will be given for examination. The students are allowed to select the question by lot. Record notebook should be submitted during the practical examination.

Sl. No	Allocation of Marks	Max. Marks
1	Circuit Diagram	20
2	Connection and Proceeding the Experiment	25
3	Reading / Calculation / Graph / Result	25
4	Viva-voce	05
TOTAL		75 Marks

Theory & practical exercises	60 Hours
Revision / Repetition	15 Hours
Total	75 Hours

R5-327 COMPUTER APPLICATIONS PRACTICAL

SUBJECT	INSTRUCTIONS		EXAMINATION			
	Hours / Week	Hours / Sem	Marks			Duration
R5-327 COMPUTER APPLICATIONS PRACTICAL	4 Hrs	60 Hrs	Internal Assessment	External Exam	Total	
			25	75	100	

SECTION – A

GRAPHICAL OPEARTING SYSTEM

Introduction to GUI OS; Features and various versions of GUI OS & its use; Working with GUI OS; My Computer & Recycle bin; Desktop, Icons and Explorer; Screen description & working styles of GUI OS; Dialog Boxes & Toolbars; Working with Files & Folders; simple operations like copy, delete, moving of files and folders from one drive to another, Shortcuts & Auto start; Accessories and Windows Settings using Control Panel – setting common devices using control panel, modem, printers, audio, network, fonts, creating users, internet settings, Start button & Program lists;

Exercises

1.
 - a. Installing screen saver and change the monitor resolution by 1280 x 960
 - b. Setting wall papers
 - c. Creating, moving, deleting and renaming a folder
 - d. Copy, paste and cut a folder/file
 - e. Displaying the properties for a file or folder
2.
 - a. Restoring files and folders from Recycle bin

- b. Creating short cuts for folder/file
- c. Finding a file or folder by name
- d. Selecting and moving two or more files/folders using mouse
- e. Sorting folders / files

WORD PROCESSING

Introduction to Word Processing – Examples – Creation of new documents, opening the existing document, insert a document into another document. Page setup, margins, gutters, font properties, Alignment, page breaks, header and footer, deleting, moving, replacing and editing text in document. Saving a document, spell checker.

Printing a document – Creating a table, entering & editing – text in tables – Changing format of table – height/width of row or column – Editing & deleting rows / columns in table – Creating columns, applying borders, watermark, shading, Templates, wizards, drawing objects, mail merge.

Exercises

3. Create the following table and perform the operations given below

- Arrange the cell alignment for the complete table as center, center (both horizontally and vertically)
- Fill the days column and hours row with 15% gray color
- Implement merging and splitting two or more cells wherever necessary
- Apply alternative foreground colors for columns

DAY	1	2	3	4	5	6	7	8
MON	← TEST →		A: JPP			CA	RDBMS	TUT
			B: RDBMS					
TUE	CA	OOP	CN	RDBMS	A: RDBMS			
					B: JPP			
WED	CN	RDBMS	OOP	RDBMS	COMMUNICATION		CN	CA
THU	OOP	A: JPP			CA	RDBMS	CN	OOP
				B: RDBMS				
FRI	COMMUNICATION		A: RDBMS		OOP	CN	RDBMS	CA
			B: JPP					
SAT	OOPS	RDBMS	N	CA	_____			

- 4. Create a standard covering letter and use mail merge to generate the customized letters for applying to a job in various organizations. Also, create a database and generate labels for the applying organizations.
- 5. Create a news letter of three pages with two columns text. The first page contains some formatting bullets and numbers. Set the document background color and add 'Confidential' as the watermark. Give the document a title which should be displayed in the header. The header/ footer of the first page should be different from other two pages. Also, add author name and date/ time in the header. The footer should have the page number.

SPREADSHEET

Introduction to Analysis Package – Examples – Concepts of Workbook & Worksheets; Using Wizards; Various Data Types; Using different features with Data, Cell and Texts; Inserting, Removing & Resizing of Columns & Rows; Working with Data & Ranges; Different Views of Worksheets; Column Freezing, Labels, Hiding, Splitting etc.; Using different features with Data and Text; Use of Formulas, Calculations & Functions; Cell Formatting including Borders & Shading; Working with Different Chart Types; Printing of Workbook & Worksheets with various options.

Exercises

6. Create a result sheet containing Candidate's Register No., Name, and Marks for six subjects. Calculate the total and result. The result must be calculated as below and failed candidates should be turned to red.

Result is Distinction if Total $\geq 70\%$

First Class if Total $\geq 60\%$ and $< 70\%$

Second Class if Total $\geq 50\%$ and $< 60\%$

Pass if Total $\geq 35\%$ and $< 50\%$ Fail otherwise

Create a separate table based on class by using auto filter feature.

7. Create a table of records with columns as Name and Donation Amount. Donation amount should be formatted with two decimal places. There should be at least twenty records in the table. Create a conditional format to highlight the highest donation with blue color and lowest donation with red color. The table should have a heading.

8. Create line chart, bar chart and pie charts to highlight the sales of the company for three different periods for the following data.

SALES BAR CHART

Period	Product 1	Product 2	Product 3	Total
JAN	35	40	50	125
FEB	46	56	40	142
MAR	70	50	40	160

SECTION – B

DATABASE

Introduction – Menus – Tool bar – Create – Edit – Save – Data types – Insert – Delete – Update – View – Sorting and filtering – Queries – Report – Page setup – Print.

Exercises

9. Create Database to maintain at least 10 addresses of your class mates with the following constraints
- Roll no. should be the primary key.
 - Name should be not null
10. Create a student's table with the following fields: Sr. No., Reg. No, Name, Marks in 5 subjects. Calculate total and percentage of 10 students. Perform the following queries.
- To find the details of distinction student
 - To find the details of first class students

- To find the details of second class students

11. Design a report for the above exercise to print the consolidated result sheet and mark card for the student.

PRESENTATION

Introduction – Opening new presentation, Parts of PowerPoint window – Opening – Saving and closing presentations – Features of PowerPoint, Background design, Word art, Clip art, Drawings, 3D settings – Animations, Sound, Views, types of views – Inserting and deleting slides, arranging slides, slides show, rehearsal, setup show, custom show – Creating custom presentations, action setting, auto content wizard, working with auto content wizard.

Exercises

12. Make a marketing presentation of any consumer product with at least 10 slides.
Use different customized animation effects on pictures and clip art on any four of the ten slides.
13. Create a Presentation about our institution / any subject with different slide transition & sound effect.

INTERNET

Introduction – Getting acquainted with Internet Connection – Browsers – Website URL – Open a website – Net Browsing – Email: Creating E-mail id – Sending, receiving and deleting E-mail – Email with Attachments – CC and BCC – Chatting – Creating Group mail – Google docs – Search Engines – Searching topics.

Most Popular Social Networking Sites: History – Features – Services – Usage of Face book, Twitter and LinkedIn. Transferring data through Wi-Fi or Bluetooth among different devices

Introduction to cybercrime – Software Piracy – Viruses – Antivirus Software

Exercises

14. Create an e-mail id and perform the following
- Write an e-mail inviting your friends to your Birthday Party.
 - Make your own signature and add it to the e-mail message.
 - Add a word attachment of the venue route
 - Send the e-mail to at least 5 of your friends.
15. Create a presentation on Google docs. Ask your friend to review it and comment on it. Use “Discussion” option for your discussions on the presentation.

Software Requirement:

1. Any GUI Operating System
2. Open Source Software / MS – Office

Reference Books:

1. MS OFFICE – Dr. S.S. Srivastava, Laxmi Publications Pvt. Ltd.
2. 2007 MS Office System Plain & Simple – Joyce & Moon, PHI Learning
3. MS Office Home and Student 2007 step by step – Preppernan, Cox & Frye, PHI Learning

Examination pattern:

Note: All the exercises have to be completed. Any two exercises will be given for examination. The students are allowed to select the question by lot. Record notebook should be submitted during the practical examination.

Sl. No	Allocation	Max. Marks
1	Writing procedure – one question from section A	15
2	Demonstration	15
3	Results	05
4	Writing procedure – one question from section B	15
5	Demonstration	15
6	Results	05
7	Viva-voce	05
TOTAL		75 Marks

Theory & practical exercises	50 Hours
Revision / Repetition	10 Hours
Total	60 Hours

**FOURTH SEMESTER
R5-431 ELECTRICAL MACHINES - II**

SUBJECT	INSTRUCTIONS		EXAMINATION			Duration
	Hours / Week	Hours / Sem	Marks			
R5-431 ELECTRICAL MACHINES - II	5 Hrs	75 Hrs	Internal Assessment	External Exam	Total	3 Hrs
			25	75	100	

Topics and Allocation of Hours:

Unit No.	Topics	Hours
I	ALTERNATOR PRINCIPLE AND CONSTRUCTION	13
II	ALTERNATOR PERFORMANCE AND TESTING	13
III	THREE PHASE INDUCTION MOTOR	13
IV	SINGLE PHASE INDUCTION MOTOR AND SYNCHRONOUS MOTOR	13
V	SPECIAL MACHINES	13
Total Instruction Hours		65

**UNIT - I
ALTERNATOR PRINCIPLE AND CONSTRUCTION**

13 Hrs

Basic principle – requirements of alternator – rotating field system – rotating armature system – advantages of rotating field (stationary armature) system – types of rotor – salient pole rotor – non salient pole rotor – constructional details of salient pole alternator – constructional details of non salient pole alternator – turbo alternator construction – alternators – brushless alternator – types of armature windings (no winding diagram) – single layer – double layer – lap and concentric winding – phase spread – integral slot winding – fractional slot winding – pitch factor – distribution factor – effect of pitch factor on EMF – advantages of chorded pitch winding – effect of pitch factor on harmonics – methods of obtaining sine wave in salient pole and non salient pole alternators – EMF equation of alternators – simple problems – critical speed – run away speed – cooling of alternators – different methods – hydrogen cooling and advantages

UNIT - II

ALTERNATOR PERFORMANCE AND TESTING

13 Hrs

Alternator on no load – armature reaction in single phase alternators on load at various power factors – effective armature resistance – leakage resistance – reactance due to armature reaction – synchronous reactance – synchronous impedance – causes of voltage drop in alternators – vector diagram of alternators on load (for lag, lead and unity power factors) – voltage regulation (definition and simple problems) – open circuit and short circuit test – determination of regulation by direct load test – pre-determination of regulation by EMF method, MMF method

Parallel operation of alternators – necessity of synchronization – advantages – methods – dark lamp method – bright lamp method – synchroscope method – synchronizing current, synchronizing power, synchronizing torque – effect of change in excitation of alternators in parallel – load sharing of two alternators – simple problems – control of active load, reactive load – infinite bus bar – control of voltage and frequency of infinite bus bar – governor characteristics

UNIT - III

THREE PHASE INDUCTION MOTOR

13 Hrs

Rotating magnetic field produced by 2ϕ and 3ϕ 2pole system – principle of operation of three phase induction motors – slip and frequency – comparison between cage and slip ring induction motors – development of phasor diagram of three phase induction motor – slip torque characteristics – stable and unstable region – no load test and blocked rotor test – development of approximate equivalent circuit – problems on the above topics – simplified circle diagram – speed control by injected EMF method, pole changing method, rotor resistance method and cascading method – starters of induction motor – direct on line starter, rotor resistance starter – auto transformer starter – star delta starter – crawling, cogging in induction motor – double cage motor

UNIT - IV

SINGLE PHASE INDUCTION MOTOR AND SYNCHRONOUS MOTOR

13 Hrs

Single Phase Induction Motor: Single phase induction motor principle – double field revolving theory for single phase induction motor – construction, principle of working and applications of split phase motors, capacitor type motors, shaded pole motor, universal motor, repulsion motor, reluctance motor

Synchronous Motor: Synchronous motor basic theory – reasons for not self starting – different methods of starting synchronous motor – vector diagram on no load – simple problems – “V” curve and inverted “V” curve for different excitation at constant input

power – effect of change in load, excitation – power factor improvement using synchronous motor– hunting – difference between 3 phase IM and synchronous motor

UNIT - V SPECIAL MACHINES

13 Hrs

AC & DC Servo motor – switched reluctance motor – permanent magnet synchronous motor – permanent magnet DC motor – stepper motor – variable reluctance stepper motor – permanent magnet stepper motor – hybrid stepper motor – comparison between variable reluctance stepper motor and switched reluctance motor – linear induction motor – working principle and applications – induction generator (principle only)

Text Books:

1. A Text Book Of Electrical Technology –Volume II by B.L. Theraja, S.Chand& Co. New Delhi.
2. Electrical Technology by Edward Hughes Addison– Wesley International Student Edition

Reference Books:

1. Electrical Machines –S.K.Bhattacharya, Principal, TTTI, Chandigar Tata McGraw Hill Publishing Company, New Delhi
2. Operation and Maintenance of Electrical Machines– B.V.S.Rao Khanna Publishers, New Delhi

Instruction Hours	65 Hours
Continuous Assessment Test 1, Test 2 & Model Examination	07 Hours
Revision / Assignments / Discussions	03 Hours
Total	75 Hours

* Pattern of the Question paper (Internal and External) - General Pattern (Theory)

R5-432 MEASUREMENTS AND INSTRUMENTS

SUBJECT	INSTRUCTIONS		EXAMINATION			
	Hours / Week	Hours / Sem	Marks			Duration
	5 Hrs	75 Hrs	Internal Assessment	External Exam	Total	
R5-432 MEASUREMENTS AND INSTRUMENTS					25	75

Topics and Allocation of Hours:

Unit No.	Topics	Hours
I	CLASSIFICATION AND CHARACTERISTICS OF INSTRUMENTS	13
II	MEASUREMENT OF VOLTAGE, CURRENT AND RESISTANCE	13
III	MEASUREMENT OF POWER AND ENERGY:	13
IV	SPECIAL INSTRUMENTS AND BRIDGES	13
V	TRANSDUCERS AND INDUSTRIAL INSTRUMENTATION (QUALITATIVE TREATMENT ONLY)	13

Total Instruction Hours	65
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UNIT - I**CLASSIFICATION AND CHARACTERISTICS OF INSTRUMENTS****13 Hrs**

General – definition of measurement – applications of measurement systems – classification – absolute and secondary instruments – indicating, recording and integrating instruments – definition of true value, accuracy, precision, percentage static error and correction, instrument efficiency – principle of operation – effects used in instruments – operating forces – deflecting, controlling and damping forces – construction details – moving system – types of supports – balancing – torque weight ratio control systems (spring control and gravity control) – damping systems – magnets – pointers and scales – introduction and elements of digital measurement systems

UNIT - II**MEASUREMENT OF VOLTAGE, CURRENT AND RESISTANCE****13 Hrs**

Types of instruments – construction, working and derivation of torque equation of moving coil, moving iron, dynamometer type and induction type (shaded pole construction) instruments – extension of instrument ranges – shunt and multiplier – calculation and requirements – simple problems – measurement of resistance – ohm meter (series and shunt type), multimeter and megger, tong tester, digital voltmeter, earth tester – Cathode Ray Oscilloscope (CRO) – CRT – constructional parts – electron gun – deflection plate – fluorescent screen – glass envelope – block diagram of a general purpose CRO – measurement of phase and frequency – applications of CRO

UNIT - III**MEASUREMENT OF POWER AND ENERGY****13 Hrs**

Types of wattmeter – construction and operation of dynamometer type wattmeter and LPF wattmeter – 3 phase two element wattmeter – construction and working of induction type single phase energy meter – friction compensation – creep and prevention – errors and adjustments in energy meters – 3 phase energy meter (connection circuit only) – testing of energy meter with phantom loading and RSS meter – measurement of power and energy using CT and PT – construction and working of single phase dynamometer type power factor meter. Power and energy measurements using electronic trivector meter – static energy meter – down loading methods – Industrial metering and tariffs

UNIT - IV**SPECIAL INSTRUMENTS AND BRIDGES****13 Hrs**

Merz-price maximum demand indicator – synchroscope – construction and working of weston type – phase sequence indicator – construction and working of rotating type – frequency meter – mechanical resonance (vibrating reed type) and Weston type frequency meters – digital frequency meter (simplified composite block diagram) – xy recorder – block diagram and applications – analog multimeter – digital multimeter
Bridges – Wheatstone bridge – basic form of AC bridge – Anderson and Schering bridge for measurement of inductance and capacitance (no derivation – formula only) – localization of cable faults – Murray and Varley loop tests to locate ground and short circuit faults

UNIT - V**TRANSDUCERS AND INDUSTRIAL INSTRUMENTATION
(QUALITATIVE TREATMENT ONLY)****13 Hrs**

Transducers: Definition –electrical transducers – classification of electrical transducers based upon principle of transduction (table) – principles and construction only for strain gauge – LVDT – RVDT – piezo electric – thermo couples – thermistors – proximity sensors – inductive and capacitive types – introduction to digital encoding transducers

Industrial Instrumentation: Measurement of strain using Wheatstone bridge – measurement of pressure using inductive transducer – measurement of angular velocity using DC tachometer generator – measurement of temperature using bimetallic thermometers – measurement of flow using electromagnetic flow meter – measurement of thickness using ultrasonic vibrations – digital PH meter – measurement of radiation using Geiger Muller tube

Text Books:

1. A Course in Electrical and Electronics Measurements and Instrumentation by A.K. Sawhney Puneet Sawhney Dhanpat Rai & Co (P) Ltd., New Delhi 1993.

Reference Books:

1. Electronic Instrumentation and Modern Electronics by H S Kalsi, Tata McGraw Hill Publishing Co. New Delhi [Learning Materials Centre, ISTE, New Delhi 16

Instruction Hours	65 Hours
Continuous Assessment Test 1, Test 2 & Model Examination	07 Hours
Revision / Assignments / Discussions	03 Hours
Total	75 Hours

* Pattern of the Question paper (Internal and External) - General Pattern (Theory)

R5-433 DIGITAL ELECTRONICS

SUBJECT	INSTRUCTIONS		EXAMINATION			Duration
	Hours / Week	Hours / Sem	Marks			
R5-433 DIGITAL ELECTRONICS	5 Hrs	75 Hrs	Internal Assessment	External Exam	Total	3 Hrs
			25	75	100	

Topics and Allocation of Hours:

Unit No.	Topics	Hours
I	NUMBER SYSTEMS AND CODES	13
II	BOOLEAN ALGEBRA	13
III	COMBINATIONAL LOGIC	13
IV	SEQUENTIAL LOGIC	13

V	DIGITAL LOGIC FAMILIES AND MEMORY	13
Total Instruction Hours		65

**UNIT – I
NUMBER SYSTEMS AND CODES 13 Hrs**

Number systems: Types – decimal – binary – octal – hexadecimal – BCD – conversion from one number system to other

Binary Arithmetic: Binary addition– subtraction – 1’s complement and 2’s complement – signed binary numbers– binary addition and subtraction using 1’s complement and 2’s complement – 9’s complement and 10’s complement

CODES: Types – binary codes, excess 3 code, gray code – conversion from one code to another code

**UNIT – II
BOOLEAN ALGEBRA 13 Hrs**

Logical operators – logic gates – OR – AND – NOT – NOR – NAND – EX–OR – EX – NOR symbols, truth table and Boolean expression – basic laws and rules in Boolean algebra and De-morgan’s theorems – realization of gates using universal gates NAND, and NOR – reducing Boolean expression using Boolean Laws – constructing logic circuit for Boolean expression – Boolean expression for logic circuits – simplification of Boolean expression using Karnaugh map (up to 4 variable)

**UNIT – III
COMBINATIONAL LOGIC 13 Hrs**

Arithmetic circuits – half adder – full adder – half subtractor – full subtractor – parity generator and checker – digital comparator – arithmetic logic unit – decoder – 3 to 8 decoder – BCD to seven segment decoder – encoder– multiplexer (2 to 1, 4 to 1 and 8 to 1) – demultiplexer (1 to 2, 1 to 4, 1 to 8)

Code conversion: Binary to BCD converter – BCD to excess 3 converter – excess 3 to BCD converter

**UNIT – IV
SEQUENTIAL LOGIC 13 Hrs**

Flip-flops – RS – D – T – JK – master slave flip-flops – edge triggered flip-flops – asynchronous binary counter – decade counter – mod n counter – up counter, down counter & up down counter – ring counter – Johnson counter – synchronous counter – state diagram – shift register – 4 bit shift register – serial in serial out – serial in parallel out – parallel in serial out – parallel in parallel out

**UNIT – V
DIGITAL LOGIC FAMILIES AND MEMORY 13 Hrs**

Digital Logic Families: TTL –CMOS – LS series – fan in – fan out – propagation delay – noise immunity for the above families

Memories: Classification of semiconductor memories – static memory – dynamic memory – static memory organization in terms of address lines, control lines and data lines – expanding memory (say 8k to 16k) – SD RAM – DDR RAM

Text Books:

1. R.P. Jain – Modern Digital Electronics – TMH 2003.
2. Albert Paul Malvino and Donald P. Leach – Digital Principles and applications – TMH – 1991

Reference books:

1. Roger L. Tokheim Macmillan – Digital Electronics – McGraw – Hill – 1994.
2. William H.Goth Mann – Digital Electronics – An introduction to theory and practice – PHI 1998.
3. Satnam P.Mathur and others – Electronic devices, Applications and Integrated Circuits – Umesh Publications – 1982.

Instruction Hours	65 Hours
Continuous Assessment Test 1, Test 2 & Model Examination	07 Hours
Revision / Assignments / Discussions	03 Hours
Total	75 Hours

* Pattern of the Question paper (Internal and External) - General Pattern (Theory)

R5-434 **LINEAR INTEGRATED CIRCUITS**

SUBJECT	INSTRUCTIONS		EXAMINATION			
	Hours / Week	Hours / Sem	Marks			Duration
R5-434 LINEAR INTEGRATED CIRCUITS	5 Hrs	75 Hrs	Internal Assessment	External Exam	Total	
			25	75	100	

Topics and Allocation of Hours:

Unit No.	Topics	Hours
I	IC FABRICATION AND INTRODUCTION TO OPERATIONAL AMPLIFIER	13
II	OP-AMP APPLICATIONS	13
III	PLL & APPLICATIONS	13
IV	D/A AND A/D CONVERTERS	13
V	IC555 TIMER, IC VOLTAGE REGULATORS AND THEIR APPLICATIONS	13
Total Instruction Hours		65

UNIT - I

IC FABRICATION AND INTRODUCTION TO OPERATIONAL AMPLIFIER 13 Hrs

IC Fabrication: Introduction – classification of IC – fundamentals of monolithic IC technology– basic planar processes – advantages of IC over discrete components – types of IC packages

Operational Amplifier: Introduction to Op-amp (IC 741) – schematic symbol for op-amp – pin diagram of IC 741 – block diagram of an op-amp – characteristics of an ideal op-amp – simple equivalent circuit of an op-amp – op-amp parameters – CMRR – slew rate – virtual ground

UNIT - II

OP-AMP APPLICATIONS

13 Hrs

Inverting amplifier, non inverting amplifier – differential amplifier – scale changer as a multiplier and divider – summing amplifier (simple problems) – voltage follower – comparator – zero crossing detector – integrator – differentiator – voltage to current converter – current to voltage converter – instrumentation amplifier – waveform generators.

Op-amp circuits using Diodes – Precision diode – peak detector – clipper – clamper

UNIT - III

PLL & APPLICATIONS

13 Hrs

Introduction to PLL – basic block schematic of PLL – definitions of lock in range – capture range – pull in range – basic components of PLL – phase detector – LPF – VCO – monolithic VCO 566 – pin diagram – basic block diagram of VCO 566. Monolithic PLL 565 – pin diagram – functional block diagram of PLL IC 565 – applications of PLL – frequency translation – frequency multiplication

UNIT - IV

D/A AND A/D CONVERTERS

13 Hrs

Digital to Analog Converter: Basics of D/A conversion – weighted resistor D/A converter – R – 2R ladder D/A converter – specifications of DAC – accuracy, resolution, monotonicity, settling time

Analog to Digital Converter : Basics of A/D conversion – sampling – sample and hold circuit – quantization – types of A/D converter – block diagram of flash, successive approximation, ramp, dual slope ADC – specifications of ADC – accuracy, resolution, conversion time – functional block diagram of IC ADC 0808

UNIT - V

IC555 TIMER, IC VOLTAGE REGULATORS AND THEIR APPLICATIONS

13 Hrs

IC 555 Timer: Pin diagram of IC 555 – functional block diagram of IC555 – applications – astable multivibrator – monostable multivibrator – Schmitt trigger – sequence timer – dual timer IC LM556

IC voltage regulators: Linear fixed voltage regulator – positive voltage regulator using IC 78xx, negative voltage regulator using IC 79xx – general purpose regulator using LM 723 – pin diagram of LM 723 – low voltage and high voltage regulator using LM 723

Text Books:

1. Linear Integrated circuits – D.Roy choudhury & Shail.B. Jain – New age Int. Pub – II Edition – 2004.
2. "Integrated circuits" – K.R. Botkar – Khanna Pulbisher's – 1996

Reference Books:

1. Introduction to system design using IC –B.S. Sonde – Wiley Eastern Limited – II Edition– 1992
2. "Operational Amplifiers and Linear Integrated circuits"– Ramakant .A Gayakwad – PHI - 2000.
3. Digital Integrated Electronics –Taub & Schilling – Mcgraw Hill – 1997

4. Operational amplifiers and Linear Integrated circuits by Robert F.Coughlin and Frederick F.Driscoll–PHI – sixth Edition–2009.
5. Linear Integrated Circuits by Salivahanan &V.S.Kanchana Baskaran–TMH–2008

Instruction Hours	65 Hours
Continuous Assessment Test 1, Test 2 & Model Examination	07 Hours
Revision / Assignments / Discussions	03 Hours
Total	75 Hours

* Pattern of the Question paper (Internal and External) - General Pattern (Theory)

R5-435 ELECTRICAL MACHINES - II AND INSTRUMENTATION PRACTICAL

SUBJECT	INSTRUCTIONS		EXAMINATION			
R5-435 AC MACHINES AND INSTRUMENTATION PRACTICAL	Hours / Week	Hours / Sem	Marks			Duration
	5 Hrs	75 Hrs	Internal Assessment	External Exam	Total	
			25	75	100	3 Hrs

AC Machines Experiments:

- 1) Load test on 1 phase alternator.
- 2) Load test on 3 phase alternator.
- 3) Load test on 3 phase squirrel cage induction motor.
- 4) Equivalent circuit of 3 phase induction motors by no load and blocked rotor tests.
- 5) To conduct no load test and blocked rotor test on the given 3 phase induction motor and to predetermine the performance characteristics by drawing circle diagram.
- 6) Variable speed characteristics of induction motor by pole changing method
- 7) Load test on single phase capacitor start Induction motor.
- 8) Power factor improvement of three phase induction motor by using capacitor.
- 9) Load test on 3 phase slip ring IM.

Instrumentation Experiments:

- 10) Calibration of ammeter and voltmeter by comparison with a standard meter.
- 11) Calibration of a wattmeter by comparison with a standard meter.
- 12) Calibration of single phase and 3 phase energy meter
- 13) Determine the resistance of alternator using Wheatstone bridge.
- 14) Measurement of unknown capacitance and inductance value using Schering and Anderson bridge.
- 15) Displacement with resistive transducer & to plot the displacement vs voltage characteristics.
- 16) Measure the intensity of light using LDR, Photo diode and photo transistor and plot their outputs with corresponding luminous intensity.
- 17) Measure the speed of motor by digital and analog methods. Measurement of displacement using linear variable differential transformer.

Examination Pattern:

Note: All the exercises in each section have to be completed. One exercise will be given for examination. The students are allowed to select the questions by lot. Record notebook should be submitted during the practical examination.

Sl. No	Allocation of Marks	Max. Marks
1	Circuit Diagram	20
2	Connection and Proceeding the Experiment	25
3	Reading / Calculation / Graph / Result	25
4	Viva-voce	05
TOTAL		75 Marks

Theory & practical exercises	60 Hours
Revision / Repetition	15 Hours
Total	75 Hours

R5-436 DIGITAL ELECTRONICS AND LINEAR INTEGRATED CIRCUITS PRACTICAL

SUBJECT	INSTRUCTIONS		EXAMINATION			Duration
	Hours / Week	Hours / Sem	Marks			
R5-436 DIGITAL ELECTRONICS AND LINEAR INTEGRATED CIRCUITS PRACTICAL	5 Hrs	75 Hrs	Internal Assessment	External Exam	Total	3 Hrs
			25	75	100	

LINEAR INTEGRATED CIRCUITS EXPERIMENTS:

- Construct and test inverting and non-inverting amplifier using operational amplifier
- Construct the scale changer and summing amplifier circuit and test their output by using operational amplifier.
- Construct the integrator and differentiator circuit using operational amplifier.
- Construct the astable multivibrator using IC555 timer.
 - Construct the monostable multivibrator using IC555 timer.
- Construct digital to analog converter(R–2R ladder type).
- Construct analog to digital converter (Successive approximation type).

DIGITAL ELECTRONICS EXPERIMENTS:

- Verify the truth table of the following logic gates AND, OR, NAND, NOT, NOR – using 74XX ICs and bread board.

2. Verification of De–Morgan’s theorem.
3. a) Construct the EX–OR Gate by using 2 NOT Gate, 2 AND Gate and 1 OR Gate.
b) Realization of combinational logic function using AND, OR and NOT gates. Verify the result.
4. Construct the Half adder and full adder using 7408, 7486 and 7432 ICs and verify its truth table.
5. Construct a Half subtractor and Full subtractor and verify the truth table using 74xx ICs.
6. Construct the 4 to 1 multiplexer using logic gates and verify the truth table.
7. Construct the 1 to 4 demultiplexer using logic gates and verify the truth table
8. Design and implementation of encoder and decoder using logic gates and verify the truth table.
9. Construction and verification of truth table for RS, D, T, JK, flip–flop.
10. Construct and verify the performance of a 4 bit binary counter using 7473 ICs
11. Construct a single digit up/down counter using IC 7490, 7475, 7447 chips and seven segment LED and check up its performance.
12. Construct parity generator and checker using discrete IC’s.

Examination Pattern:

Note: All the exercises in each section have to be completed. One exercise will be given for examination. The students are allowed to select the questions by lot. Record notebook should be submitted during the practical examination.

Sl. No	Allocation of Marks	Max. Marks
1	Circuit Diagram / Logic Diagram	20
2	Connection and Proceeding the Experiment	25
3	Output / Calculation / Graph / Result	25
4	Viva-voce	05
TOTAL		75 Marks

Theory & practical exercises	60 Hours
Revision / Repetition	15 Hours
Total	75 Hours

R5-437 LIFE AND EMPLOYABILITY SKILLS PRACTICAL

SUBJECT	INSTRUCTIONS		EXAMINATION			
	Hours / Week	Hours / Sem	Marks			Duration
R5-437 LIFE AND EMPLOYABILITY SKILLS PRACTICAL	4 Hrs	60 Hrs	Internal Assessment	External Exam	Total	
			25	75	100	

Topics and Allocation of Hours:

Sl. No.	Topics	Hours
1	Part – A: LISTENING ACTIVITY TOPICS: Global Warming, Pollution, Environment	12
2	Part – B: SPEAKING ACTIVITY TOPICS: Communication; Behavioural Skills; Productivity – Comparison with developed countries; Occupational Safety, Health Hazard; Accident & Safety, First-Aid;	28
3	Part – C: WRITING AND READING ACTIVITY TOPICS: Facing Interviews; Entrepreneurship and Project Preparation	08
4	Part – D: GOOGLE SEARCH AND PRESENTATION in Record note (for Continuous Assessment as Assignments on any five topics) TOPICS: Productivity; Quality Tools, Quality Circles, Quality Consciousness; Labour Welfare Legislation, Labour Welfare Acts; Gender Sensitisation (a. Important Constitutional & Legal Provisions for Women in India, b. Harassment of Women at Workplace (Prevention & Prohibition & Redressal) Act 2013, c. Guidelines & Norms laid down by Hon'ble Supreme Court in Vishaka and Others, d. National Commission for Protection of Child Rights (NCPCR), e. Protection of Children from Sexual Offences (POCSO) Act & Rule 6 of POCSO Rules, 2012.	12
TOTAL		60 Hrs

TOPICS AND ALLOCATION OF HOURS:

S.No	Section	Skills to be Acquired	Activity	No. of Hours
1	Part – A LISTENING ACTIVITY TOPICS: Global Warming, Pollution, Environment	<ul style="list-style-type: none"> Deductive / Reasoning Skills Cognitive Skills Retention Skills 	• Taking down notes / hints	04
			• Answering questions	04
			• Fill in the blanks the exact words heard	04
2	Part – B SPEAKING ACTIVITY TOPICS: Communication; Behavioural Skills; Productivity – Comparison with developed countries; Occupational Safety, Health Hazard; Accident & Safety, First-Aid;	<ul style="list-style-type: none"> Personality/Psychological Skills Pleasing & Amiable Skills Assertive Skills Expressive Skills Fluency/Compatibility Skills Leadership/Team Spirit Skills 	• Instant sentence making	02
			• Say expressions /phrases	02
			• Self introduction/ another higher official in company	04
			• Describe/explain products	06
			• Dialogues on technical grounds	06
			• Discuss & interact	08

			<ul style="list-style-type: none"> • Group Discussion 	
3	Part – C READING AND WRITING ACTIVITY TOPICS: Facing Interviews; Entrepreneurship and Project Preparation	<ul style="list-style-type: none"> • Creative & Reasoning Skills • Creative & Composing Skills • Attitude & Aim Skills • Entrepreneurship Skills 	<ul style="list-style-type: none"> • Frame questions based on patterns • Make sentences based on patterns • Prepare a resume • Prepare an outline of a project to obtain loan from bank in becoming an entrepreneur 	02 02 02 02
4	Part – D GOOGLE SEARCH AND PRESENTATION in Record note (for Continuous Assessment as Assignments on any five topics) TOPICS: Productivity; Quality Tools, Quality Circles, Quality consciousness; Labour Welfare Legislation, Labour Welfare Acts; Gender Sensitisation (a. Important Constitutional & Legal Provisions for Women in India, b. Harassment of Women at Workplace (Prevention & Prohibition & Redressal) Act 2013, c. Guidelines & Norms laid down by Hon'ble Supreme Court in Vishaka and Others, d. National Commission for Protection of Child Rights (NCPDR), e. Protection of Children from Sexual Offences Act & Rule 6 of POCSO Rules, 2012.	<ul style="list-style-type: none"> • Cognitive Skills • Presentation Skills& • Interactive Skills 	<ul style="list-style-type: none"> • Search in the website • Prepare a presentation • Discuss & interact • Record as assignment 	12

LEARNING STRUCTURE**100 Marks**

- Focus more on Speaking & Listening Skills
- Attention less on Reading & Writing Skills
- Apply the skills in fulfilling the Objectives on Focused Topics

a) Listening**25 Marks**

1. Deductive Reasoning Skills (taking down notes/hints)	10
2. Cognitive Skills (answering questions)	10
3. Retention Skills (filling in blanks with exact words heard)	05

b) Speaking Extempore / Prepared**30 Marks**

1. Personality/Psychological Skills (instant sentence making)	05
2. Pleasing & Amiable Skills (say in phrases/expressions)	05
3. Assertive Skills (introducing oneself/others)	05
4. Expressive Skills (describe/explain things)	05
5. Fluency/Compatibility Skills (dialogue)	05

6. Leadership/Team Spirit Skills (group discussion)	05
c) Writing & Reading	20 Marks
1. Creative & Reasoning Skills (frame questions on patterns)	05
2. Creative & Composing Skills (make sentences on patterns)	05
3. Attitude & Aim Skills (prepare resume)	05
4. Entrepreneurship Skills (prepare outline of a project)	05

d) Continuous Assessment (Internal Marks)	25 Marks
(search, read, write down, speak, listen, interact & discuss)	
1. Cognitive Skills (Google search on focused topics)	
2. Presentation Skills & Interactive Skills (after listening, discuss)	

Total Marks: 100 Marks

CONTINUOUS ASSESSMENT (INTERNAL MARKS)

I	LISTENING (3 exercises), SPEAKING (6 exercises) and READING & WRITING (4 exercises). All activities shall be recorded in the Record note. 13 exercises x 10 marks = 130 marks. Reduced to 10 marks	10 Marks
II	Present in the Record Note on any 5 topics prescribed in syllabus as Assignments Topics. 5 Assignments x 10 Marks = 50 marks. Average of 5 Assignments is 10 marks	10 Marks
III	Attendance	05 Marks
Total		25 Marks

MODEL QUESTION

Time: 3 Hours

Maximum Marks: 75

A. LISTENING 25 Marks

- | | |
|--|----|
| 1. Listen to the content and take down notes/hints | 10 |
| 2. Listen to the content and answer the following questions. | 10 |
| 3. Listen to the content and fill in the blanks the exact words heard. | 05 |

B. SPEAKING 30 Marks

- | | |
|---|----|
| 1. Say in a sentence instantly on hearing the word (5 words, one after another). | 05 |
| 2. Say any five expressions commonly used in communication. | 05 |
| 3. Imagine, a consultant has come to your Dept. Introduce him to your subordinates. | 05 |
| 4. Explain/describe the product you are about to launch in the market. | 05 |
| 5. Speak with your immediate boss about the progress you have made. | 05 |
| 6. Discuss within the group on the topic of focus prescribed in the syllabus. | 05 |

C. WRITING & READING 20 Marks

1. Make sentences from the pattern given by changing sets of words with your own. 05

1.	When	do	you	return?
b.	How	is	his performance?	
c.	Where	has	the manager	gone?
d.	What	is	the progress	today?
e.	Why	are	the machines	not

2. Make sentences from the pattern given by changing sets of words with your own. 05

a	The workers	are	on strike		
b	The labourers	are paid	well	in this factory	
c	There	is	a rest room	for the workers	

d	These	are	the new products	launched	by our company
e	Almost everyone	came	to the company	on motorbikes	

3. Prepare a resume for the post of Department Manager. 05

4. Prepare an outline of a project to obtain a loan. (Provide headings and subheadings) 05

I. Guidelines for setting the question paper:

A. LISTENING:

Only Topics related to POLLUTION / ENVIRONMENT / GLOBAL WARMING are to be taken for listening section. The same after / Topic should not however be repeated in the above 3 Listening Activities.

B. SPEAKING:

1. WORDS of common usage
2. Fragments – expression of politeness, courtesy, cordiality
3. Introduce yourself as an engineer with designation or Introduce the official visiting your company/department
4. Describe/Explain the product/machine/department
5. Dialogue must be with someone in the place of work.
6. Group of six/eight Discuss the focused topic prescribed in the syllabus

C. WRITING & READING:

1. Provide five different structures.
Students are to substitute at least one set with some other word/words
2. Provide five different structures.
Students are to substitute at least one set with some other word/words
3. Provide some post related to industries.
4. Outline of the project (skeleton/structure) Only the various headings and subheadings
Content is not needed

II. Conduct of End Practical Examination with Allocation of time for each Part:

PART – C. WRITING & READING:

Firstly, the students are seated after all the formalities are completed and they shall be asked to write on the answer paper the Written & Reading (Part - C) for half an hour.

DURATION: 30 Minutes + (15 extra minutes, while other student attends Speaking Part)

PART – A. LISTENING:

Secondly, after 30 minutes of the Start of the Examination, they may be asked to stop Writing and shall be directed to start the Listening (Part – A) of the End Examination on a separate sheet of paper. They shall also be given instructions that once the Listening Part is completed their papers shall be collected. The First of the Listening Topic decided by both external and internal Examiners shall be read to the students for three to five minutes. As they listen they can take down notes. They shall be given 10 minutes to restructure the notes, if necessary. Then, the Second Listening Topic (a different topic) shall be read to the students. They shall be asked to write the answers for the 5 questions given one after another within 10 minutes. Next, the Third topic (a new topic) is read to the students. Then they are dictated the sentences with 5 blanks, on which they shall fill in the exact word heard. This shall be completed in 10 minutes. Thus the LISTENING PART can be completed in 45 Minutes. The Listening part of the answer papers are collected from the students, immediately after.

DURATION: 45 Minutes

PART – B. SPEAKING

Thirdly, as the Speaking (Part – B) starts, the students are asked to resume the Written & Reading (Part – C) and complete within half an hour. The Examiners, both Internal and External shall take 14 (8+6) or 16 (8+8) students of their choice in the batch of 30 candidates. Initially, each Examiner on their part shall call each student one after another to answer to the first four questions (1 to 4), individually within a time span of 50 minutes. Once all the 4 questions are done, the Examiner shall divide them into groups of 6/8 students. Then the examiner can have the group discussion for 5 minutes followed by dialogue in pairs from the group for 3 minutes per pair (4 pairs x 3 minutes = 12 minutes) Then the examiner has the next group of students with whom the examiner conducts the group discussion followed by dialogues in pairs for the same duration. Thus each examiner can finish 16 students in 1 hour 30 minutes, the Part – B Speaking Part.

DURATION: 90 Minutes simultaneously by Each Examiner for 16 students of each set

NOTE: While awarding marks for this SPEAKING (Part – B), the following shall be observed for uniformity in evaluation.

Question 1:

Relevant expression of thought (1 mark for each sentence uttered)

Question 2:

Relevant expressions of Politeness / Courtesy / Etiquette / Mannerism / Request (NOT necessarily each of these but in general 5 Expressions uttered, award 1 mark each)

Questions 3, 4 and 5:

While evaluating each student, the student's Posture, Gestures, Dress code, Pronunciation (2 marks) and Relevance to the content (3 marks) shall be observed and then marks be awarded accordingly.

Question 6: GROUP DISCUSSION

NOTE: The Examiner shall choose a topic from the Question Bank provided in the Syllabus for the group of 6/8 students. The same topic shall not be repeated in any other group or batch.

While assessing and evaluating each of the students in the group, the following are to be observed. Each one's Participation, Confidence in expression, Reacting to the expressed views (assent/refute) amiably and amicably, Relevance to the topic of discussion, Lead and conclude the topic of discussion (1 mark each) may be assessed and marks be awarded accordingly. Thus, a Batch of 30 Students can be examined within 3 hours. Listening 45 minutes, Speaking 90 Minutes, Writing maximum 45 Minutes. (180 Minutes)

Assignment Topics:

III. Guidelines for recording the material on the focused topics in the Record note.

Write in the record note, **on any five topics**, from the list of topics given below. **10 Marks**
(5 topics x 10 marks = 50 marks. Thus, the Average of 5 topics is 10 Marks)

NOTE:

5 students can form a group and choose any 5 topics under the guidance of the English Faculty and Google search and then present them in the class for interaction. Finally they have to be written as Assignments in the Record Note.

Of the 5 topics chosen, 1 topic should compulsorily be taken from the 11th to the 15th topic given below (which are specially the TOPICS ON GENDER SENSITISATION) and the rest of the 4 topics shall be chosen from the 1st to 10th topic given below.

Topics for Assignments:

1. Productivity in Industries – Comparison with developed countries
2. Quality Tools, Quality Circles and Quality Consciousness
3. Effective Management
4. House Keeping in Industries
5. Occupational Safety and Hazard
6. Occupational Accident and First Aid

7. Labour Welfare Legislations
8. Labour Welfare Acts and Rights
9. Entrepreneurship
10. Marketing Analysis, Support and Procurement
11. Important Constitutional and Legal Provisions For Women in India
12. The Harassment of Women at Workplace (Prevention and Prohibition & Redressal) Act,2013
13. Guidelines and Norms laid down by the Hon'ble Supreme Court in Vishaka and Others
14. The National Commission for Protection of Child Rights (NCPCR)
15. The Protection of Children from Sexual Offences (POCSO) Act & Rule of POCSO Rules,2012

LIFE AND EMPLOYABILITY SKILLS: QUESTION BANK

A. LISTENING

25 Marks

1.	Listen to the content and take down notes/hints.	10 Marks
2.	Listen to the content and answer the following questions.	10 Marks
3.	Listen to the content and fill in the blanks with the exact words heard.	5 Marks

NOTE: Only Topics related to pollution/environment/global warming are to be taken for listening section. The same Matter/Topic should not however be repeated in the above 3 Listening Activities.

B. SPEAKING

30 Marks

1. Say in a sentence instantly on hearing the word (5 words must be given one after another) 5 Marks

NOTE: The examiners at the time of Practical Exam may provide Words which are commonly used in day to day life.

2. Say any 5 expressions commonly used in communication. 5 Marks

NOTE: Students are supposed to say 5 expressions reflecting Politeness / Courtesy / Etiquette / Mannerism / Request

3. Introducing Oneself/Others in Organisation. 5 Marks

QUESTIONS:

- Introduce yourself as a prospective candidate for the company while facing the interview.
- Imagine the General Manager from the Head Office of your company has come to inspect your factory. Introduce him.
- Imagine a Consultant has come to your department. Introduce him to your subordinates.
- New Factory Manager has been appointed. Introduce him to all the employees of your firm.
- Introduce yourself after joining the department/factory/company.
- Assume that the Inspector of Factories has come to check the quality of products and the safety standards adopted as per Govt. Norms and Regulations. Introduce him to the staff of all departments for their co- operation, in this regard.
- A Marketing Company Representative visits your factory to buy your product. Introduce him to your Supervisors.

4. Explain/Describe the Product/Machine/Department. 5 Marks

QUESTIONS:

- Explain/Describe the product, you are about to launch in the market.
- Describe the newly installed modern machine in your company which is purchased for the purpose of increasing the production.
- Explain the functioning and the efficiency of the machine that you have manufactured in your company.
- Illustrate the launch of new model car and its capabilities.
- Describe your department

5. Dialogue at the Place of Work.

5 Marks

QUESTIONS:

- As the Department Head, call the Supervisor and talk to him about the installation of the new machines in your factory.
- Talk to your colleague working in the factory about the safety standards to be implemented in your factory after the visit of Inspector of Factories.
- Speak to your colleague about the training you had at the Head Quarters and the outcome of the training in handling the latest machine installed in your factory.
- Call the Subordinate who is irregular and careless in his work. Advise him.
- Speak to your Higher Officer about the steps taken to stop the strike proposed by the workers of your factory.
- Speak with your immediate boss about the progress you have made.

6. Group Discussion

5 Marks

NOTE: Depending on the strength of the students in a Batch, they may be divided into groups of six/eight and be asked to discuss on anyone of the following topics given below.

QUESTIONS:

Discuss within the group on any one of the topics given below.

1. Productivity in Industries – comparison with developed countries
2. Quality Tools, Quality Circles and Quality Consciousness
3. Effective Management
4. House Keeping in Industries
5. Occupational Safety and Hazard
6. Occupational Accident and First- Aid
7. Labour Welfare Legislation
8. Labour Welfare Acts and Rights
9. Entrepreneurship
10. Marketing Analysis, Support and Procurement
11. Global Warming
12. Environment
13. Pollution
14. Importance of Communication in English
15. Constitutional and Legal Provisions for Women in India
16. Harassment of Women at Workplace (Prevention and Prohibition, And Redressal) Act,2013
17. Guidelines & Norms laid down by Honourable Supreme Court in Vishaka and Others
18. National Commission for Protection of Child Rights (NCPCR)
19. Protection of Children from Sexual Offences Act & Rule 6 of POCSO Rules, 2012

C. WRITING & READING

20 Marks

1. Frame new questions from the pattern given by changing sets of words with your own.

5 Marks

QUESTION:

When	do	you	return?
How	is	his performance?	
Where	has	the manager	gone?
What	is	the progress	today?
Why	are	the machines	not functioning?

Model answers. (Change of one set is sufficient in each of the sentences)

1. When do you come?
2. Where is his performance?
3. Where has the supervisor gone?
4. How is the progress today?
5. Why are the machines not working?

What	are	the methods	adopted?
When	is	the manager	coming?
Why	will	he	give?
Where	has	the product	gone?
How	do	you	perform?

Why	do	you	go?
Which	has	he	completed?
What	will be	the outcome?	
How	does	this	work?
Where	is	the progress?	

What	would be	the result?	
Whose product	has come out	recently?	
When	shall	the new product	be launched?
How	can we	overcome	this problem?
Who	is	the manager	in this factory?

On Whom	would you	put	the blame?
Who	shall be	responsible	for this?
What	do you	want to	convey?
When	can we	see	performance?
How	will you	solve	this problem?

When	do	they	award	the winners?
Why	don't	you	realise	your weakness?
Who	will make	him	responsible?	
What	do	you	want	coffee or tea?
Where	can	we	meet	him?

2. Make sentences from the pattern given by changing sets of words with your own. 5 Marks

QUESTION:

The workers	are	on strike.	
The labourers	are paid	well	in this factory.
There	is	a rest room	for the workers.
These	are	the new products	launched.
Almost everyone	came	to the company	on motorbikes.

Model answers. (Change of one set is sufficient in each of the sentences)

1. The engineers are on strike.
2. The labourers are paid less in this factory.
3. There is a rest room for the women staff.
4. These are the new products introduced.
5. No one came to the company on motorbikes.

We	work	for the society.	
They	introduce	new techniques	for efficiency.
Wearing	helmets	is	compulsory.
Our company	announces	bonus	for the employees.
Labour laws	are followed	strictly	in our company

The Supervisor	enquired		the workers.
The industry	is shut		for May Day.
New methods	are introduced		in the company.
Gopi	works		in the first shift.
We	manufacture		bolts & nuts.

The workers	are	the assets	of this factory.
The welfare	of the employees	is looked after.	
Safety	is	the first priority	for any company.
Labour welfare laws	are	strictly	followed.
I	take	pride	to work here.

He	was promoted	as G.M	yesterday.
My life	has been	wonderful	here.
These	will be	my targets.	
They	are	in the canteen	now.
We	have	a bike stand	near the gate.

The doctor	is	on duty.	
Edison	was	a great scientist.	
There	were	many trees	in our village.
Our teachers	give	us	useful guidance.
Most children	go	to school	by vans.

3. Prepare a resume. 5 Marks

QUESTIONS:

- Prepare a resume for the post of Department Manager.
- Write a resume for the post of Programme Trainee in a software firm.
- Prepare a resume for the post of Site Supervisor in a Tower Erection company.
- Prepare a resume for the post of Senior Sales Manager, in an organisation.
- Write a resume for the post of Site Engineer in a company.
- Prepare a resume for the post of Lecturer in a Polytechnic College.

4. Prepare an outline of a Project. 5 Marks

QUESTIONS:

- Prepare an outline of a Project to obtain a loan. (Provide only headings and subheadings)
- Prepare an outline of a Project to start a factory with your own funds. (Provide only headings and subheadings)
- Prepare an outline of a Project to start a Retail Selling Showroom with your friends as partners. (Provide headings and subheadings only)
- Prepare an outline of a Project so as to start a factory on Job-work Basis from the order you can get from a big company. (Provide only headings and subheadings)

LIFE AND EMPLOYABILITY SKILLS PRACTICAL

Time: 3 Hours

Maximum Marks: 75

Name:
Register Number:

Date:
Time:

A. LISTENING (25 Marks)	
1. Listen to the content and take down notes/hints	10
2. Listen to the content and answer the following questions.	10
3. Listen to the content and fill in the blanks the exact words heard.	05
B. SPEAKING (30 Marks)	
1. Say in a sentence instantly on hearing the word (5 words, one after another).	05
2. Say any five expressions commonly used in communication.	05
3. Imagine, a consultant has come to your department. Introduce him to your subordinates.	05
4. Explain/describe the product you are about to launch in the market.	05
5. Speak with your immediate boss about the progress you have made.	05
6. Discuss within the group on the topic of focus prescribed in the syllabus.	05

C. WRITING & READING (20 Marks)

1. Frame new questions from the pattern given by changing sets of words with your own. 05

a.	When	do	you	return?
b.	How	is	his performance?	
c.	Where	has	the manager	gone?
d.	What	is	the progress	today?
e.	Why	are	the machines	not functioning?

2. Make sentences from the pattern given by changing sets of words with your own. 05

a.	The workers	are	on strike.		
b.	The labourers	are	well	in this factory.	
c.	There	is	a rest room	for the workers.	
d.	These	are	the new	launched	by our company.
e.	Almost	came	to the company	on motorbikes.	

3. Prepare a resume for the post of Department Manager. 05
4. Prepare an outline of a project to obtain a loan. (Provide headings and subheadings) 05

Signature of the Candidate

DETAILED ALLOCATION OF MARKS: (75 MARKS)

ACTIVITY	MARKS						TOTAL MARKS
	A.1 (10)		A.2 (10)		A.3		
PART – A LISTENING							
PART – B SPEAKING	B.1 (05)	B.2 (05)	B.3	B.4	B.5	B.6	
PART – C WRITING & READING	C.1 (05)		C.2 (05)		C.3 (05)		
GRAND TOTAL							

Signature of the Internal Examiner

Signature of the External Examiner

Theory & writing exercises	50 Hours
Revision / Repetition	10 Hours

	Total 60 Hours
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FIFTH SEMESTER
R5-531 GENERATION, TRANSMISSION AND SWITCHGEAR

SUBJECT	INSTRUCTIONS		EXAMINATION			
	R5-531 GENERATION, TRANSMISSION AND SWITCHGEAR	Hours / Week	Hours / Sem	Marks		
5 Hrs		75 Hrs	Internal Assessment	External Exam	Total	
			25	75	100	3 Hrs

Topics and Allocation of Hours:

Unit No.	Topics	Hours
I	GENERATION OF ELECTRICAL POWER	13
II	AC TRANSMISSION AND HVDC TRANSMISSION	13
III	LINE INSULATORS AND UNDERGROUND CABLES	13
IV	CIRCUIT BREAKERS AND OVER VOLTAGE PROTECTION	13
V	PROTECTIVE RELAYS AND GROUNDING	13
Total Instruction Hours		65

UNIT – I**GENERATION OF ELECTRICAL POWER****13 Hrs**

Conventional Methods of Power Generations: Hydro power plant: Schematic arrangement – selection of site – advantages and disadvantages. Thermal power plant: Schematic arrangement – selection of site – advantages and disadvantages. Nuclear power plant: Schematic arrangement – selection of site, advantages and disadvantages – comparison of above power plants. Co-Generation: Principle of operation – types of co-generation. Diesel power plant: Schematic arrangement – advantages and disadvantages. Gas power plant – Schematic arrangement – advantages and disadvantages. Pumped storage power plant: Schematic arrangement – advantages and disadvantages.

Renewable Energy Source Power Generation: Solar power generation: Basic principle – schematic arrangement – advantages – disadvantages and applications. Wind power generation: Basic principle – schematic arrangement – advantages – disadvantages and applications

Fuel Cell Power Generation: Design and principle of operation – types of fuel cells – comparison of fuel cells – efficiency – advantages – applications

Inter Connected Grid System: Advantages of inter-connected systems – load transfer through inter connector – load curves and load duration curves – connected load – average load – maximum demand factor – plant capacity factor – load factor and its significance – diversity factor – load sharing between base load and peak load plants – load despatching centre – simple problems.

UNIT – II**AC TRANSMISSION AND HVDC TRANSMISSION****13 Hrs**

AC Transmission: Introduction – typical layout of AC power supply scheme various system of power transmission – advantages and disadvantages of AC transmission – high transmission voltage – advantages – economic choice of transmission voltage – elements of a transmission line – economic choice of conductor size – Kelvin's law – its limitation – over head line – conductor materials and their properties – line supports – its properties – types of supports and their applications – spacing between conductors – length of span – sag in over head lines – calculation of sag – when the supports are at equal and unequal levels – effect of wind and ice loading over the line conductor – problems – constants of a transmission line – transposition of transmission lines – skin effect – Ferranti effect – corona – formation and corona loss – factors affecting corona – advantages and disadvantages – classification of OH transmission lines – performance of single phase short transmission line – voltage regulation and transmission efficiency – problems

HVDC Transmission: Advantages and disadvantages of DC transmission – layout scheme and principle of high voltage DC transmission – DC link configurations (mono polar, bipolar and homo polar) – HVDC convertor station (schematic diagram only) – comparison between constant current and constant voltage HVDC systems

UNIT – III

LINE INSULATORS AND UNDERGROUND CABLES

13 Hrs

Line Insulators: Introduction – line insulator materials – properties of insulators – types – cause of failure of insulators – testing of insulators – potential distribution over suspension insulator string – string efficiency – methods of improving string efficiency – problems

Underground Cables: Introduction – advantages and requirement of cables – construction of a three core cable – insulating materials for cables – properties of insulating materials used in cables – classification of cables – cables for three phase service – construction of belted cable, screened cable, pressure cables – laying of underground cables – direct laying, draw-in system, solid system – advantages and disadvantages – grading of cables – capacitance grading, inter-sheath grading (no derivation and problems) – cable faults – OC, SC and earth faults – Murray loop test for fault location

UNIT – IV

CIRCUIT BREAKERS AND OVER VOLTAGE PROTECTION

13 Hrs

AC Circuit Breakers: Basic principle of circuit breaker – arc phenomenon – methods of arc extinction – arc voltage – restriking voltage and recovery voltage – rate of rise of re striking voltage – current chopping – interruption of capacitive current – resistance switching – CB ratings – breaking capacity, making capacity, short time rating – auto reclosing in circuit breakers – classification of CBS – construction, working principle, merits and demerits of air blast CB, SF₆ and vacuum CB – ELCB

DC Circuit Breakers: DC breaking – problems of DC breaking – schematic for HVDC CB – producing current zero

Fuses: Fuses – desirable characteristics – fuse element materials – current rating of fuse elements – fusing current – cut-off current – LV fuses – rewirable fuse, HRC cartridge fuse, HRC fuse with tripping device – HV fuses – cartridge type, liquid type and metal clad – fuses – comparison of fuse and circuit breaker

Over voltage protection: Voltage surge – causes of over voltage – lightning – types of lightning strokes – direct stroke, indirect stroke – harmful effects of lightning – protection

against lightning – earthing screen, overhead ground wires, lightning arresters – expulsion type, gapless arrester

UNIT – V PROTECTIVE RELAYS AND GROUNDING

13 Hrs

Protective relays: Basic principle – fundamental requirements of protective relaying – primary and back up protection – relay characteristics – relay timing – instantaneous relay – inverse time relay and definite time lag relay – inverse definite minimum time relay – classification of relays – construction, principle of operation and applications of induction type over current relay directional and non-directional distance relay, differential relay, negative sequence relay, induction type reverse power relay, earth leakage relay. static relays – basic elements of static relay

Earthing: Definition – necessity – types – pipe earthing – plate earthing

Grounding: Introduction – equipment grounding – system grounding – ungrounded neutral system – necessity of neutral grounding – methods – solid grounding, resistance grounding reactance grounding, resonant grounding – earthing transformer

Text Books:

- 1.Principles of Power System by V.K.Metha, S.Chand & Company, New Delhi, 4th Edition Reprint 2007
- 2.Electrical Power Distribution System by AS Pabla, Tata McGraw Hill Publishing Co, New Delhi.

Reference Books:

- 1.Principles of Power by V.K.Mehta, S. Chand & Co,New Delhi
- 2.Electrical Power System by CL Wadhawa New Age International, New Delhi (Fourth Edition, 2000).
- 3.HVDC Power Transmission System & Technology by KR. Padiyar, New Age International, New Delhi (Reprint 2005).
- 4.Energy Auditing in Electrical Utilities by Rajiv Shankar. Viva Books First 2010

Instruction Hours	65 Hours
Continuous Assessment Test 1, Test 2 & Model Examination	07 Hours
Revision / Assignments / Discussions	03 Hours
Total	75 Hours

* Pattern of the Question paper (Internal and External) - General Pattern (Theory)

R5-532 MICROPROCESSOR AND MICROCONTROLLER

SUBJECT	INSTRUCTIONS		EXAMINATION			Duration
	Hours / Week	Hours / Sem	Marks			
R5-532 MICROPROCESSOR AND MICROCONTROLLER	5 Hrs	75 Hrs	Internal Assessment	External Exam	Total	3 Hrs
			25	75	100	

Topics and Allocation of Hours:

Unit No.	Topics	Hours
I	8085 MICROPROCESSOR	13

II	8051 MICROCONTROLLER	13
III	I/O and TIMER	13
IV	SERIAL COMMUNICATION AND PERIPHERAL DEVICES	13
V	APPLICATION OF MICROCONTROLLER	13
Total Instruction Hours		65

UNIT - I**8085 & 8086 MICROPROCESSOR****13 Hrs**

Introduction – features – architecture of 8085 microprocessor – pin-out diagram of 8085 – bus organization – instruction formats – addressing mode – architecture of 8086 microprocessor

UNIT - II**8051 MICROCONTROLLER****13 Hrs**

Introduction – features of 8051 – comparison between microprocessor and microcontroller – architecture of 8051 – pin details – internal RAM, ROM – register set of 8051 – I/O ports – input /output pins – memory organization – data memory & program memory – external memory – timers & counters – serial port – interrupt structure – addressing modes – instruction set of 8051 – classification of 8051 instructions – data transfer instructions – arithmetic instructions – logical instructions – branching instructions – bit manipulation instructions

UNIT - III**I/O AND TIMER****13 Hrs**

Bit addresses for I/O and RAM – I/O programming – I/O bit manipulation programming – programming 8051 timers – timer 0 and timer 1 registers – different modes of timer – mode 0 programming – mode 1 programming – mode 2 programming – mode 3 programming – counter programming – different modes of counter – mode 0 programming – mode 1 programming – mode 2 programming – mode 3 programming

UNIT - IV**SERIAL COMMUNICATION AND PERIPHERAL DEVICES****13 Hrs**

Basics of serial programming – RS 232 standards – 8051 connection to RS 232 – 8051 serial communication programming – programming the 8051 to transfer data serially – programming the 8051 to receive data serially – 8051 interrupts – programming timer interrupts – programming external hardware interrupts – programming the serial communication interrupt – interrupt priority in 8051

Peripheral Devices: Block diagram and control word format of the following peripheral devices 8255, 8254, 8259, 8279

UNIT - V**APPLICATION OF MICROCONTROLLER****13 Hrs**

Introduction – interfacing 8051 with 8255 – RS 232C serial interface – ADC/DAC interfacing – simple keypad interface – seven segment LED display interfacing – LCD

display interfacing – interfacing sensors – interfacing of stepper motor – DC motor interfacing – interfacing traffic light controller – introduction to PIC and Arduino microcontroller.

Text Books:

1. Microcontrollers, Principles and Applications – Ajit pal – PHI Ltd., – 2011.
2. Microcontroller and its application – Godse, Technical Publication.

Reference Books:

1. Microprocessor and Microcontroller – R. Theagarajan SciTech Publication.
2. Microprocessors and Microcontrollers – M.Senthil Kumar, M.Saravanan, S.Jeevananthan
3. The 8051 Microcontroller: Architecture Programming and Applications – Kenneth.J.Ayala, Penram International Publication.
4. Microcontroller – Mazdi & Mazdi
5. Microcontroller and Applications – R.Theagarajan SciTech Publication.
6. Digital Design – M. Morris Mano Third Edition, Prentice Hall 2002.

Website references:

- 1) www.8052.com
- 2) www.8051projects.info
- 3) www.keil.com/books/8051books.asp
- 4) www.hobbyprojects.com/microprocessor-tutorials.html.

Instruction Hours	65 Hours
Continuous Assessment Test 1, Test 2 & Model Examination	07 Hours
Revision / Assignments / Discussions	03 Hours
Total	75 Hours

* Pattern of the Question paper (Internal and External) - General Pattern (Theory)

R5-533 PROGRAMMABLE LOGIC CONTROLLER

SUBJECT	INSTRUCTIONS		EXAMINATION			Duration
	Hours / Week	Hours / Sem	Marks			
R5-533 PROGRAMMABLE LOGIC CONTROLLER	5 Hrs	75 Hrs	Internal Assessment	External Exam	Total	3 Hrs
			25	75	100	

Topics and Allocation of Hours:

Unit No.	Topics	Hours
I	CONTROL CIRCUIT COMPONENTS	13
II	AC MOTOR CONTROL CIRCUITS	13
III	INTRODUCTION TO PLC	13
IV	PLC PROGRAMMING	13
V	APPLICATION OF PLC AND INTRODUCTION TO SCADA	13

Total Instruction Hours	65
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UNIT - I CONTROL CIRCUIT COMPONENTS

13 Hrs

Switches – push button, selector, drum, limit, pressure, temperature (Thermostat), float, zero speed and proximity switches. Relays – voltage relay, DC series current relay, frequency response relay, latching relay and phase failure relay (single phasing preventer). Over current relay – bimetallic thermal over load relay and magnetic dash pot oil filled relay. Timer – thermal, pneumatic and electronic timer. Solenoid Valve – solenoid type contactor (air break contactor), solid state relay, simple ON–OFF motor control circuit

UNIT - II AC MOTOR CONTROL CIRCUITS

13 Hrs

Motor current at start and during acceleration – no load speed and final speed of motor – DOL starter – automatic auto transformer starter – closed circuit transition – star/delta starter fully automatic – plug stopping of the motor – dynamic braking – rotor resistance starter for slip ring induction motor – inching and jogging

Industrial Control Circuits: Planner machine – skip hoist control – automatic control of a water pump – over head crane – trouble spots in control circuits – general procedure for trouble shooting

UNIT - III INTRODUCTION TO PLC

13 Hrs

Definition – requirements of PLC – advantages over relay logic – block diagram – parts – operation – description & connectivity – communication – memory – PLC scanning – I/O interfacing – hand held programming terminals PCs & PLC programming – industrial computer – IEC 1131 programming standards – ladder diagram (LD) – functional block diagram (FBD) – instructional list structural text (ST) – sequential functional chart
Conventional wiring diagram versus PLC ladder logic – logic functions – AND logic, OR logic two input & three inputs with truth table – not logic exclusive OR logic combinational logic – priority logic elements

UNIT - IV PLC PROGRAMMING

13 Hrs

Normally open (or) examine ON – normally closed (or) examine OFF – one shot instruction – latch output coil unlatch coil

ON delay timer instruction (TON) – OFF delay timer instruction (TOFF) – Retentive timer instruction (RTO) – Counter up instruction (CTU) – Counter down instruction (CTD) – Reset instruction (RES)

Equal (EQU) – Not equal (NEQ) – Less than (LES) – Less than or equal (LEQ) – Greater than (GRT) – Greater than or equal (GEQ) – Masked comparison for equal (MEQ) – Limit test (LIM)

Add (ADD) – Subtract (SUB) – Multiply (MUL) – Divide (DIV) – Clear (CLR) – Square root (SQR) – AND – OR – EX–OR – NOT

UNIT - V

APPLICATION OF PLC AND INTRODUCTION TO SCADA**13 Hrs**

Ladder logic diagram for DOL starter – star/delta starter – fluid filling operation – traffic light control – control of light – two speed motor control circuit using ladder logic – automatic rotor resistance starter control using ladder logic

PLC maintenance – internal PLC faults – faults external to PLC – programmed error – watch dog – safety – hardware safety circuits – troubleshooting – SCADA – introduction –necessity – advancement with PLC – applications

Text Books:

1. Introduction to Programmable Logic Controllers by Gary Dunning, CengageLearning India Pvt Ltd – Third Edition 2011.
2. Technician's Guide to Programmable Logic Controllers by Richard A. Cox, Delmer – Sixth
3. Programmable Logic Controllers – Principle and Applications by John W. Webb, Prentice Hall

Reference Books:

1. Programmable Logic Controllers by Peteruzell
2. Programmable Logic Controllers by George L Batter, Mc-Graw Hill
3. Programmable Logic Controllers by Colin D Simpson, Prentice Hall
4. Control of Electrical Machines by S.K. Bhattacharya New Age ,International Publishers, New Delhi
5. Programmable Logic Controllers – Programming Methods and Applications by John R Hackworth and Fredrick D. Hackworth, Pearson Education
6. Programmable Logic Controllers by W. Bolton, Newness
7. Programmable Controller Theory and Implementation by L.A.Bryan, E.A.Bryan, An Industrial Text Company Publication

Instruction Hours	65 Hours
Continuous Assessment Test 1, Test 2 & Model Examination	07 Hours
Revision / Assignments / Discussions	03 Hours
Total	75 Hours

* Pattern of the Question paper (Internal and External) - General Pattern (Theory)

R5-534.1 COMMUNICATION ENGINEERING

SUBJECT	INSTRUCTIONS		EXAMINATION			Duration
	Hours / Week	Hours / Sem	Marks			
R5-534.1 COMMUNICATION ENGINEERING	5 Hrs	75 Hrs	Internal Assessment	External Exam	Total	3 Hrs
			25	75	100	

Topics and Allocation of Hours:

Unit No.	Topics	Hours
I	NETWORKS AND ANTENNAS	13
II	AMPLITUDE MODULATION	13
III	FREQUENCY AND PULSE MODULATION	13
IV	AUDIO SYSTEMS	13

V	VIDEO SYSTEMS	13
Total Instruction Hours		65

UNIT - I**NETWORKS AND ANTENNAS****13 Hrs**

Networks: Symmetrical and asymmetrical networks, characteristic impedance and propagation constant.

Equalizer: Definition, types and applications

Attenuator: Definition, types – symmetrical T and Pi attenuators – simple problems – applications

Filters: Definition, types – circuit elements and cutoff frequencies of LPF, HPF and BPF – simple problems – applications

Antennas: Definition – types of antenna: Mono pole and dipole antenna, directional and omni directional antenna, Dipole arrays, Yagi antenna, parabolic antenna – Antenna parameters: directive gain, directivity, radiation pattern and polarization – applications

Propagation: Ground wave propagation, sky wave propagation and space wave propagation

UNIT - II**AMPLITUDE MODULATION****13 Hrs**

Introduction to Modulation: Definition – need for modulation – types of modulation – Frequency spectrum – relationship between wavelength and frequency

Amplitude Modulation: Definition – simple signal diagram for amplitude modulation, expression for amplitude modulation, expression for modulation index – sidebands: DSB, SSB and VSB.

AM Transmitter: Types of transmitters – high level AM transmitter, low level AM transmitter and SSB transmitter

AM Receiver: Types of receiver – TRF receiver, super heterodyne receiver and SSB receiver – Selection of IF- AGC types: simple and delayed AGC

UNIT - III**FREQUENCY AND PULSE MODULATION****13 Hrs**

Frequency Modulation: Definition – simple signal diagram for frequency modulation, expression for frequency modulation, expression for modulation index.

FM Transmitter: Types of transmitters – direct FM transmitter, indirect FM transmitter and stereophonic FM transmitter

FM Receiver: stereophonic FM receiver – AFC – comparison of FM and AM

Pulse modulation: Definition – types – generation and detection of PAM, PWM, PPM, PCM & DPCM

UNIT - IV**AUDIO SYSTEMS****13 Hrs**

Microphones: Definition – construction and performance of the following microphones: carbon, condenser, piezo-electric, moving coil and velocity ribbon

Loud speakers: Definition – constructional details of dynamic cone type, horn type and electro-static loud speakers, woofer, midrange and tweeter, cross-over network. Surround-sound systems

Audio recording and reproduction: Compact disc system – MP3 system – DVD system – stereophonic system – Hi-Fi system principles-DTS

**UNIT - V
VIDEO SYSTEMS**

13 Hrs

Monochrome Television: Scanning principles – synchronization – aspect ratio – composite video signal – TV broadcasting standards – TV transmitter – TV receiver

Color TV: Principles of color transmission and reception – color CCD camera, LCD – LED display unit – plasma display – Principles of Handy cam, CCTV and cable TV.

Text Books:

1. Electronic communication Systems – Kennedy – TMH
2. TV and Video engineering – Arvind M.Dhake – TMH.

Reference Books:

1. Networks lines and fields – John D.Ryder, PHI
2. Electronic Communication – Dennis Roddy and John colen – PHI
3. Fundamentals of Acoustics – Kingsler & frey – Wiley Eastern ltd.
4. Communication Electronics – Principles and application – Louis E Frenzel, Third Edition, Tata McGrawhill publication
5. Audio and Video system – Principles, maintenance and Troubleshooting by R.Gupta Second Edition McGrawHill Education (P) Ltd

Instruction Hours	65 Hours
Continuous Assessment Test 1, Test 2 & Model Exam	07 Hours
Revision / Discussion	03 Hours
Total	75 Hours

* Pattern of the Question paper (Internal and External) - General Pattern (Theory)

R5-534.2 VLSI DESIGN

SUBJECT	INSTRUCTION		EXAMINATION			Duration
	Hours / Week	Hours / Sem	Marks			
R5-534.2 VLSI DESIGN	5 Hrs	75 Hrs	Internal Assessment	External Exam	Total	3 Hrs
			25	75	100	

Topics and Allocation of Hours:

Unit No.	Topics	Hours
I	COMBINATIONAL CIRCUIT DESIGN AND BUILDING BLOCKS	13
II	VHDL FOR COMBINATIONAL CIRCUIT	13
III	SEQUENTIAL CIRCUIT DESIGN STEPS	13

IV	VHDL FOR SEQUENTIAL CIRCUIT	13
V	PLDS AND FPGA	13
Total Instruction Hours		65

UNIT - I**COMBINATIONAL CIRCUIT DESIGN AND BUILDING BLOCKS****13 Hrs**

Combinational Circuit Design: NMOS and CMOS logic implementation of switch, NOT, AND, OR, NAND, and NOR (not any circuit). digital logic variable, functions, inversion, gate/circuits – Boolean algebra and circuit synthesis using gates (Up to 4 variables).

Combinational Circuit Building Blocks: Circuit synthesis using multiplexer, demultiplexer, encoders and decoders

UNIT - II**VHDL FOR COMBINATIONAL CIRCUIT****13 Hrs**

Introduction to VLSI and its design process – Introduction to CAD tool and VHDL – design entry, synthesis, and simulation. Introduction to HDL and different level of abstraction – VHDL statements and assignment – representation of signals

VHDL Code: Implementation of Mux, Demux, encoder, decoder. Four bit arithmetic adder, subtractor and comparator in VHDL

UNIT - III**SEQUENTIAL CIRCUIT DESIGN STEPS****13 Hrs**

Sequential Circuit Design: Introduction / refreshing to flip-flops and its excitation table, counters and shift registers

Design Steps: State diagram, state table, state assignment – Example for Moore and Mealy machines – Design of modulo counter (up to 3 bit) with only D flip-flops through state diagram

UNIT - IV**VHDL FOR SEQUENTIAL CIRCUIT****13 Hrs**

VHDL constructs for storage elements – VHDL code for D Latch / D, JK and T Flip- flops with or without reset input

VHDL Examples: Counters (up to 3 bit). Moore and Mealy type serial adder

UNIT - V**PLDS AND FPGA****13 Hrs**

Introduction to PLA and PAL – Implementation of combinational circuits with PAL and PLA (up to 4 variable) – Introduction to complex programmable logic device, field programmable gate array and custom chips (functional block diagram) – Introduction to ASIC – Types of ASIC.

Text books:

1. "Digital Design" M.Morris Mano Michael D Ciletti Pearson Education 2008

Reference Books:

1. "Fundamentals of Digital Logic with VHDL design" Stephen brown and Vranesic 2nd edition McGrawHill,2008

2. “VHDL Primer” Bhasker J Prentice Hall India – 2009

Instruction Hours	65 Hours
Continuous Assessment Test 1, Test 2 & Model Exam	07 Hours
Revision / Discussion	03 Hours
Total	75 Hours

* Pattern of the Question paper (Internal and External) - General Pattern (Theory)

R5-534.3 ELECTRICAL MACHINE DESIGN

SUBJECT	INSTRUCTIONS		EXAMINATION			
	R5-534.3 ELECTRICAL MACHINE DESIGN	Hours / Week	Hours / Sem	Marks		
5 Hrs		75 Hrs	Internal Assessment	External Exam	Total	
			25	75	100	3 Hrs

Topics and Allocation of Hours:

Unit No.	Topics	Hours
I	ELECTRICAL MACHINE DESIGN – BASIC CONSIDERATION	13
II	MAGNETIC CIRCUIT CALCULATIONS	13
III	DESIGN OF TRANSFORMER	13
IV	DESIGN OF DC MACHINES	13
V	DESIGN OF AC MACHINES	13
Total Instruction Hours		65

UNIT - I**ELECTRICAL MACHINE DESIGN – BASIC CONSIDERATION****13 Hrs**

Design definition – design consideration – limitation – constructional elements of transformers and rotating machines – constructional materials of electrical machines – conducting magnetic and insulating materials standard specification – general design process – main dimensions of rotating machines – electrical and magnetic losses – temperature – rise – class of duty – limits of temperature rise

UNIT - II**MAGNETIC CIRCUIT CALCULATIONS****13 Hrs**

Magnetic circuits of DC machines – round rotation AC machines – salient pole AC machines and transformer – specific magnetic and electrical loading – factor influencing the specific and magnetic loading – magnetic leakages – magnetizing curves – calculation of magnetizing force for the air gap of rotating machines and for teeth – leakage flux – leakage reactance – armature slot leakage reactance

UNIT - III**DESIGN OF TRANSFORMER****13 Hrs**

Important considerations – core and shell types – distribution transformers and power transformers – core section – clearance – yoke section – main dimension – single phase core type transformers – three phase core type transformer – output coefficient – voltage per turn specific magnetic and electric loading of transformer – Winding design – cross over, helix, disc helix.

**UNIT - IV
DESIGN OF DC MACHINES**

13 Hrs

Important design consideration – number of poles – advantages of large number of poles – air gap – armature slot – current density – field system – commutator – design of large DC motor – Specific magnetic and electric loading of dc machines

**UNIT - V
DESIGN OF AC MACHINES**

13 Hrs

AC machine design consideration – power equation – separation of diameter and length – problems. Three phase induction motor – important design consideration – standard frames and stampings – gap length – flux density – current density – power factor – efficiency – slot combination – winding – design of 3 phase induction motors – Three phase synchronous machines – important design consideration – radial gap length – stator slot – stator coil – rotor construction – design of 3 phase synchronous machines

Text books:

1. Course in electrical machine design by A.K.Sawhney, Dhanrai publishing company
2. Design of Electrical Machine by Mittle V.N Standard Book – House

Reference books:

1. Principles of Electrical Machine Design by R.K.Agarwa, S.K.Kataria & Sons
2. Electrical Machine Design by A.Nagoor, Kani RBA Publications

Instruction Hours	65 Hours
Continuous Assessment Test 1, Test 2 & Model Exam	07 Hours
Revision / Discussion	03 Hours
Total	75 Hours

* Pattern of the Question paper (Internal and External) - General Pattern (Theory)

R5-535 MICROCONTROLLER PRACTICAL

SUBJECT	INSTRUCTIONS		EXAMINATION			Duration
	Hours / Week	Hours / Sem	Marks			
R5-535 MICROCONTROLLER PRACTICAL	5 Hrs	75 Hrs	Internal Assessment	External Exam	Total	3 Hrs
			25	75	100	

Experiments:

Microcontroller:

1. Addition and subtraction of two 8 bit numbers using 8051 microcontroller.
2. Multiplication and division of two 8 bit numbers using 8051 microcontroller.
3. Multi – byte addition of given numbers.
4. Finding the maximum value in an array..
5. BCD to Hex conversion and Hex to BCD conversion.
6. Hex to ASCII and ASSCII to binary.
7. Parity bit generation.

8. Solve the given Boolean equation.

Interfacing with application boards:

1. Interfacing the 4*4 Key MATRIX with 8279
2. Interfacing push to on switches and relays with 89C51.
3. Interfacing the two digit seven segments LED with 8051.
4. Interfacing of stepper motor with microcontroller.
5. Interfacing of the given DC motor with microcontroller.
6. Interfacing ADC 0808 with 89C51
7. Interfacing 2*16 Line text LCD with 8051.

Examination Pattern:

Note: All the exercises in each section have to be completed. One exercise will be given for examination. The students are allowed to select the questions by lot. Record notebook should be submitted during the practical examination.

Sl. No	Allocation of Marks	Max. Marks
1	Program	35
2	Execution	25
3	Output & Result	10
4	Viva-voce	05
TOTAL		75 Marks

Theory & practical exercises	60 Hours
Revision / Repetition	15 Hours
Total	75 Hours

R5-536 PROGRAMMABLE LOGIC CONTROLLER PRACTICAL

SUBJECT	INSTRUCTIONS		EXAMINATION			Duration
	Hours / Week	Hours / Sem	Marks			
R5-536 PROGRAMMABLE LOGIC CONTROLLER PRACTICAL	5 Hrs	75 Hrs	Internal Assessment	External Exam	Total	3 Hrs
			25	75	100	

Experiments

1. Control a motor from a distance location (Remote Control)
2. Sequence and Preventive interlocking operation using push button and contactor.
3. Forward and Reversing Control of a D.C motor
4. Test the working of single phase preventer.
5. Dynamic Braking of an Induction Motor
6. Developing the ladder diagram for the truth table of logic gates.
7. Jogging control of an Induction Motor using PLC
8. Start an AC motor using Fully Automatic star / Delta starter using PLC.
9. Forward and reversing control of an AC Motor using PLC.
10. Develop and test the control circuit for two speed pole changing motor using PLC
11. Develop the program for displaying the digital calendar

12. Develop and test the control circuit for Traffic light system using ladder programming.
13. Develop and test the control circuit for Automatic rotor resistor starter using ladder programming
14. Car parking program using Counter Instruction. Capacity of the parking area is
 Parking area is empty ← . . . → Empty & Space lights are ON.
 5 Cars ← . . . → Full light only ON.
 Using up down counters.
15. Develop and test the control circuit for Lift operation using ladder programming
16. Develop and test the control circuit for conveyor using SCADA programming

Examination Pattern:

Note: All the exercises have to be completed. One exercise will be given for examination. The students are allowed to select the questions by lot. Record notebook should be submitted during the practical examination

Sl. No	Allocation of Marks	Max. Marks
1	Circuit Diagram / Ladder Diagram	20
2	Connection and Proceeding the Experiment	25
3	Output / Calculation / Graph / Result	25
4	Viva-voce	05
TOTAL		75 Marks

Theory & practical exercises	60 Hours
Revision / Repetition	15 Hours
Total	75 Hours

R5-537 SIMULATION PRACTICAL - I

SUBJECT	INSTRUCTIONS		EXAMINATION			Duration
	Hours / Week	Hours / Sem	Marks			
R5-537 SIMULATION PRACTICAL - I	4 Hrs	60 Hrs	Internal Assessment	External Exam	Total	3 Hrs
			25	75	100	

EXPERIMENTS:

1. Generation of signals using function generator and the measurement of frequency and amplitude using CRO
2. Add and subtract two numbers
3. Add two waveforms.
4. Multiplication of two arrays
5. Plot the random set of data using three different charts (strip, scope and sweep)
6. find the factorial of the given number using for-loop.
7. Create user name and password for login purpose.

8. Develop sub VI for arithmetic calculator
9. Verification of logic gates
10. Multiplexer and demultiplexer
11. Encoder and decoder
12. Solving Boolean equation

Simulation Software: Any Open Source / Labview / Open Lab / Pylab-works

Examination Pattern:

Note: All the exercises in each section have to be completed. One exercise will be given for examination. The students are allowed to select the questions by lot. Record notebook should be submitted during the practical examination

Sl. No	Allocation of Marks	Max. Marks
1	Circuit Diagram	20
2	Connection and Proceeding the Experiment	25
3	Output / Simulation and Result	25
4	Viva-voce	05
TOTAL		75 Marks

Theory & practical exercises	50 Hours
Revision / Repetition	10 Hours
Total	60 Hours

SIXTH SEMESTER

R5-631 DISTRIBUTION UTILISATION AND ELECTRICAL ESTIMATION

SUBJECT	INSTRUCTIONS		EXAMINATION			
	Hours / Week	Hours / Sem	Marks			Duration
R5-631 DISTRIBUTION UTILISATION AND ELECTRICAL ESTIMATION	5 Hrs	75 Hrs	Internal Assessment	External Exam	Total	
			25	75	100	

Topics and Allocation of Hours:

Unit No.	Topics	Hours
I	DISTRIBUTION	13
II	ELECTRIC TRACTION	13
III	ELECTRICAL UTILISATION	13
IV	INTRODUCTION TO ELECTRICAL ESTIMATION	13

V	DOMESTIC, COMMERCIAL AND INDUSTRIAL INSTALLATION ESTIMATE	13
Total Instruction Hours		65

UNIT - I DISTRIBUTION

13 Hrs

Substation: Introduction – sub stations – classification of sub stations – indoor and outdoor SS – gas insulated SS – comparisons – layout of 110 / 11KV substation and 11KV / 400V distribution substation – substation equipments – bus bar – types of bus bar arrangement – advantages and disadvantages

Distribution: Distribution system – requirements of a distribution system – parts of distribution system – classification of distribution systems – comparison of different distribution systems (AC and DC) – AC distribution – types – connection schemes of distribution system – AC distribution calculations – calculation of voltage at load points on single phase distribution systems (with concentrated load only) – distribution fed at one end, both ends and ring mains – problems – three phase, four wire, star connected unbalanced load circuit – problems – consequence of disconnection of neutral in three phase four wire system (illustration with an example)

UNIT - II ELECTRIC TRACTION

13 Hrs

Introduction – Traction systems – advantages and disadvantages of electric traction

System of Track Electrification: Methods of supplying power – rail connected system and over head system – OH equipments – contact wire, catenary and droppers – current collection gear for OHE – bow and pantograph collector – different systems of track electrification – advantages of single phase low frequency AC System – booster transformer – necessity – methods of connecting BT – neutral sectioning

Traction Mechanics: Units and notations used in traction mechanics – speed time curve for different services – simplified speed time curve – derivation of maximum speed – crest speed, average speed, schedule speed (definitions only) – tractive effort and power requirement – specific energy output – specific energy consumption

Traction motors and control: Desirable characteristics of traction motors – motors used for traction purpose – methods of starting and speed control of DC traction motors – rheostatic control – energy saving with plain rheostatic control – series – parallel control – energy saving with series parallel starting – shunt transition – bridge – transition

Recent Trends: Recent trends in electric traction – Magnetic Levitation (MAGLEV) – suspension systems

UNIT - III ELECTRICAL UTILISATION

13 Hrs

Illumination: Definition and units of different terms used in illumination – solid angle, light, luminous flux, luminous intensity, candle power, illumination, MSCP, MHCP, MHSCP – reduction factor – luminance or brightness – glare – lamp efficiency – space height ratio – essentials of good lighting system – laws of illumination – sources of light – arc lamp – halogen lamp – discharge lamps – gaseous discharge lamps – fluorescent lamp sodium vapour lamp – high pressure mercury vapour lamp – neon tube

Electric Heating: Introduction – advantages of electric heating – modes of heat transfer – classification of electric heating – power frequency electric heating – direct and indirect resistance heating – infrared heating – arc heating – high frequency electric heating – induction heating – eddy current heating and dielectric heating

Electric welding: Introduction – Types of Electric welding – Requirements of good weld – Preparation of work – Resistance welding – Butt welding, Spot welding, Seam welding, Projection welding and Flash welding

UNIT - IV

INTRODUCTION TO ELECTRICAL ESTIMATION

13 Hrs

a) Indian Electricity Rules:

Rules 28, 30, 31, 46, 47, 54, 56, 57, 77, 79, 87 & 88

b) Electrical Symbols and Standards as per IE Rules:

Need of electrical symbols – list of symbols – electrical diagram – methods of representation of wiring diagram

c) Internal wiring & Wire size

Wiring systems – types of wiring – points to be considered for selection of wiring – comparison – looping back system and joint box system and tree system – position of switches, cutouts, main switch board, sub-distribution boards. Considerations for selecting wire size – size of conductors/cable used for domestic installation, service connection, distributors – power rating of some important household electrical appliances – selection of fuses.

UNIT - V

DOMESTIC, COMMERCIAL AND INDUSTRIAL INSTALLATION ESTIMATE 13Hrs

Elements of Estimating: Introduction – purpose of estimating and costing – qualities of good estimator – essential elements of estimating and costing – important factors of estimating and costing – conditions and requirements for domestic, commercial and industrial installation – steps to be followed in preparing electrical estimate (domestic, industrial and agricultural installation)

Estimate the quantity of material required for

- (1) Residential single bed room Flat (1BHK).
- (2) Industrial power wiring having 4 or 5 machines.
- (3) Irrigation Pump motor (5hp) wiring.
- (4) Street Light service having 12 lamp light fitting

Text books:

- 1. A Course in Electrical Power by Soni & Gupta, Dhanpat Rai & Sons, Delhi
- 2. IE Rules 1943
- 3. Electrical Design, Estimating & Costing-Surjith Singh.

Reference books:

- 1. Power System Protection and Switchgear by B Ram & DN Viswakarma, TMH 1995 (Reprint 2000)
- 2. Modern Electric Traction by H Partab, Dhanpat Rai & Sons, New Delhi
- 3. Utilization of Electric Power by NV Suryanarayana, Tata McGraw Hill Publishing Co, New Delhi
- 4. Switchgear protection and Power System by Sunil. S. Rao Khanna Publication, 2008

Instruction Hours	65 Hours
Continuous Assessment Test 1, Test 2 & Model Exam	07 Hours

Revision / Discussion	03 Hours
Total	75 Hours

* Pattern of the Question paper (Internal and External) - General Pattern (Theory)

R5-632 POWER ELECTRONICS AND DRIVES

SUBJECT	INSTRUCTIONS		EXAMINATION			
	Hours / Week	Hours / Sem	Marks			Duration
	6 Hrs	90 Hrs	Internal Assessment	External Exam	Total	
R5-632 POWER ELECTRONICS AND DRIVES					25	75

Topics and Allocation of Hours:

Unit No.	Topics	Hours
I	THYRISTORS AND TRIGGER CIRCUITS	16
II	PHASE CONTROLLED RECTIFIER	16
III	COMMUTATION AND INVERTER CIRCUITS	16
IV	CHOPPERS AND CYCLOCONVERTERS	16
V	CONTROL OF DRIVES	16
Total Instruction Hours		80

UNIT - I**THYRISTORS AND TRIGGER CIRCUITS****16 Hrs**

Thyristors family – Silicon Controlled Rectifier SCR – symbol, working, characteristics, holding current, latching current, dv/dt , di/dt ratings, thermal ratings (junction temperature, transient thermal resistance), gate protection – Insulated Gate Bipolar transistor (IGBT) – symbol, working, characteristics and equivalent circuit – symbol, working and characteristics of DIAC, TRIAC, SUS, SCS, SBS, LASCR and GTO.

Gate trigger circuits – DC triggering, AC triggering, pulse gate triggering – pulse transformer in trigger circuit – electrical isolation by opto isolator – resistance firing circuit and waveform – resistance capacitor firing circuit and waveform, synchronized UJT triggering (ramp triggering) – ramp and pedestal trigger circuit for AC load – IC based advance triggering circuits for SCR & TRIAC (using IC TCA 785) – microcontroller based trigger circuits, block diagram & flow chart.

UNIT - II**PHASE CONTROLLED RECTIFIER****16 Hrs**

Half wave controlled rectifier with resistance load, resistance inductive load, effect of freewheeling diode with waveform – single phase fully controlled bridge with RL load – average DC output voltage – rectifier mode – inverter mode – waveform for $\alpha = 60^\circ$ – input power factor (definition and expression) – single phase half controlled bridge with RL load – average DC output voltage – waveform – input power factor (definition and expression) – single phase dual converter

3 phase fully controlled bridge with RL load – firing sequence – average DC output – voltage and current waveform with respect to line to line supply voltage – 3 phase half controlled bridge with RL load – average DC output – continuous conduction mode –

discontinuous conduction mode – waveform – complete protection of converter – including surge current and voltage, dv/dt and di/dt protection

UNIT - III

COMMUTATION AND INVERTER CIRCUITS

16 Hrs

SCR turn off methods – natural commutation – forced commutation – Class A, Class B, Class C, Class D, Class E, and Class F

Inverter classifications – 1ϕ series inverter – basic parallel inverter – voltage and current waveform – 1ϕ full bridge inverter – 1ϕ McMurray Bedford (complementary commutated) full bridge inverter – 1ϕ inverter output voltage control by pulse width modulation control (dc reference) – basic 3 phase bridge inverter with 120° conduction mode and 180° conduction mode – circuit, trigger sequence, waveform and applications – multilevel inverters – pulse width modulated inverters, (single pulse, multiple pulse, sinusoidal pulse) UPS, online, offline – control circuit for SMPS

UNIT - IV

CHOPPERS AND CYCLOCONVERTERS

16 Hrs

Principle of chopper – control strategies (time-ratio and current limit control) – step up chopper – Jones chopper – Morgan chopper – AC chopper – DC to DC converter without Isolation – Buck, Boost, Buck Boost, Cuk converters – DC to DC converter with isolation three configurations – Fly back, Forward, Push Pull converters.

Cycloconverter – basics – 1ϕ to 1ϕ cycloconverter – input, output waveform with resistive load – 1ϕ bridge type cycloconverter – 3ϕ to 3ϕ cycloconverter – schematic diagram – basic circuit

UNIT - V

CONTROL OF DRIVES

16 Hrs

Control of DC Drives: Basic DC motor speed equation – operating region of armature voltage control and field current control – constant torque and constant HP regions – schemes for separately excited DC motor speed control – single phase full converter drives – circuit, operating quadrants, waveform – power factor improvement in phase controlled converter – phase angle control – closed loop control of DC drives – basic block diagram – Phase Locked Loop (PLL) control of DC drives – block diagram

Control of AC drives: Torque – speed characteristic of 3 phase induction motor – speed control of induction motor – stator voltage control, variable frequency control – necessity of maintaining v/f ratio constant – rotor resistance control – inverters for variable voltage and frequency control – static Scherbius drive (slip power recovery scheme) – space vector control scheme

Text Books:

1. Power Electronics – M.D. Singh and K.B. Khanchandani, Tata McGraw Hill Pub. Co., New Del
2. Thyristor Electronics – M.S. Berde, Khanna Publishers, New Delhi

Reference Books:

1. Power Electronics – Converter Applications and Design – Mohan Underland Robbins, John Wiley
2. Fundamentals of Electrical Drives – G.K. Dubey, Narosa Publishing House, New Delhi.
3. Power Electronics – Dr P S Bimhra, Khanna Phublisher – 1991
4. Power Electronics – Muhammad H.Rashid Prentice – Hall of India Pvt.New Delhi. 3rd Edition – 2005.

Instruction Hours	80 Hours
Continuous Assessment Test 1, Test 2 & Model Exam	07 Hours
Revision / Discussion	03 Hours

Total	90 Hours
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* Pattern of the Question paper (Internal and External) - General Pattern (Theory)

R5-633.1 **BIO-MEDICAL INSTRUMENTATION**

SUBJECT	INSTRUCTIONS		EXAMINATION			
	Hours / Week	Hours / Sem	Marks			Duration
R5-633.1 BIO-MEDICAL INSTRUMENTATION	5 Hrs	75 Hrs	Internal Assessment	External Exam	Total	
			25	75	100	

Topics and Allocation of Hours:

Unit No.	Topics	Hours
I	PHYSIOLOGICAL & CLINICAL MEASUREMENT	13
II	BIO-MEDICAL RECORDERS	13
III	THERAPEUTIC INSTRUMENTS	13
IV	BIO-TELEMETRY AND PATIENT SAFETY	13
V	MODERN IMAGING TECHNIQUES	13
Total Instruction Hours		65

UNIT - I

PHYSIOLOGICAL & CLINICAL MEASUREMENT

13 Hrs

Elementary ideas of cell structure, heart and circulatory system, control nervous system, Musculo-skeletal system, respiratory system – body temperature and reproduction system. Bio-potential and their generation – resting and action potential – propagation of action potential

Electrodes – micro – skin – surface – needle electrodes measurement of blood pressure (direct, indirect) – instantaneous flow (electromagnetic flow meter, ultrasonic blood flow meter) – blood pH measurement of respiration rate – lung volume – heart rate

UNIT - II

BIO-MEDICAL RECORDERS

13 Hrs

Electro Cardio Graph (ECG) – lead system – ECG electrodes – ECG amplifiers – ECG recording units – analysis of ECG curves – nervous system – EEG recorder – 10 – 20 lead system – recording techniques – EEG wave types – clinical use of EEG – brain tumour Electro-Myo Graph (EMG) – EMG waves – measurement of conduction velocity

UNIT - III

THERAPEUTIC INSTRUMENTS

13 Hrs

Cardiac pacemaker – classification – external pace makers – implantable pacemaker – pacing techniques – programmable pacemaker – power source of implantable pacemakers (Hg batteries, nuclear batteries, lithium cells) cardiac defibrillators – types – AC – DC defibrillators Heart lung machine – oxygenators – blood pumps – peristaltic pump – heart valves – problems of artificial heart valves

**UNIT - IV
BIO-TELEMETRY AND PATIENT SAFETY**

13 Hrs

Introduction – physiological – adaptable to Bio-telemetry – components of a Bio-telemetry system – application of telemetry in patient care – problems associated with implantable telemetry. Fluid balance – electrolytic balance – acid base balance. Physiological effects of electric current – micro and macro shock – leakage current – shock hazards from electrical equipment. Methods of accident prevention – grounding – double insulation – protection by low voltage – ground fault circuit interrupter – isolation of patient connected parts – isolated power distribution system. Safety aspects in electro surgical units – burns, high frequency current hazards

**UNIT - V
MODERN IMAGING TECHNIQUES**

13 Hrs

LASER beam properties – block diagram – operation of CO₂ and NDYag LASER – applications of LASER in medicine. X-ray apparatus – block diagram – operation – special techniques in X-ray imaging – Tomogram – computerized axial tomography – Ultrasonic imaging techniques – Echo cardiography – Angiography

Text Books:

1. Biomedical Instrumentation, Dr.M. Arumugam, Anuradha publications, chennai
2. Biomedical Instrumentation and measurement by Leslie Cromwell –Fred.J. Weibell,

Reference Books:

1. Medical Electronics by Kumara doss
2. Medicine and ClinicalEngineering by Jacobson and Webstar
3. Handbook of Bio – Medical Instrumentation by R. S. Khandpur

Instruction Hours	65 Hours
Continuous Assessment Test 1, Test 2 & Model Exam	07 Hours
Revision / Discussion	03 Hours
Total	75 Hours

* Pattern of the Question paper (Internal and External) - General Pattern (Theory)

R5-633.2 MAINTENANCE OF ELECTRICAL EQUIPMENTS

SUBJECT	INSTRUCTIONS		EXAMINATION			Duration
	Hours / Week	Hours / Sem	Marks			
R5-633.2 MAINTENANCE OF ELECTRICAL EQUIPMENTS	5 Hrs	75 Hrs	Internal Assessment	External Exam	Total	3 Hrs
			25	75	100	

Topics and Allocation of Hours:

Unit No.	Topics	Hours
I	TOOLS AND ACCESSORIES	13
II	INSTALLATION	13
III	INSPECTION	13
IV	MAINTENANCE	13
V	MAINTENANCE OF DISTRIBUTION TRANSFORMER	13
Total Instruction Hours		75

UNIT - I**TOOLS AND ACCESSORIES****13 Hrs**

Tools, accessories and instruments required for installation, maintenance and repair work – knowledge of Indian Electricity rules – safety codes – causes and prevention of accidents – artificial respiration of an electrocuted person – workmen's safety devices

UNIT - II**INSTALLATION****13 Hrs**

Installation of transmission and distribution lines – erection of steel structures, connecting jumpers, tee – off points, joints and dead ends; crossing of roads, streets, power / telecommunication lines and railway line crossings, clearances – earthing of transmission lines and guarding, spacing and configuration of conductors – Arrangement for suspension and strain Insulators, bird guards, anti-climbing devices and danger plates

UNIT - III**INSPECTION****13 Hrs**

Elementary idea regarding inspection and handling of transformers – Pole mounted substations – plinth mounted substations – grid substation – bus bars – isolation – voltage and current transformers – lightning arrestors – control and relay panels – HT/LT circuit breakers – LT switches – installation of power / distribution transformers – dehydration

UNIT - IV**MAINTENANCE****13 Hrs**

Types of maintenance – maintenance schedules – procedures – maintenance of transmission and distribution system – location of faults using meggar – effect of open or loose neutral connections – provision of proper fuses on service lines and their effect on system – causes of dim and flickering lights

UNIT - V

MAINTENANCE OF DISTRIBUTION TRANSFORMERS**13 Hrs**

Transformer maintenance and points to be attended in respect of various items of equipment – checking of insulation resistance, transformer oil level and BDV test of oil – measurement of earth resistance – domestic Installation – Introduction – testing of electrical installation of a building

Text Books:

1. Rao S, Testing, Commissioning, Operation and Maintenance of Electrical Equipment, Khanna Technical Publication, New Delhi.
2. Asfaq Hussain “Basic Electrical Engineering”, Dhanpat Rai

Reference Books:

1. Sharotri SK, *Preventive Maintenance of Electrical Apparatus*, Katson Publishing House, Ludhiana

Instruction Hours	65 Hours
Continuous Assessment Test 1, Test 2 & Model Exam	07 Hours
Revision / Discussion	03 Hours
Total	75 Hours

* Pattern of the Question paper (Internal and External) - General Pattern (Theory)

R5-633.3 COMPUTER HARDWARE AND NETWORKING

SUBJECT	INSTRUCTIONS		EXAMINATION			Duration
	Hours / Week	Hours / Sem	Marks			
R5-633.3 COMPUTER HARDWARE AND NETWORKING	5 Hrs	75 Hrs	Internal Assessment	External Exam	Total	3 Hrs
			25	75	100	

Topics and Allocation of Hours:

Unit No.	Topics	Hours
I	MOTHERBOARD COMPONENTS AND MEMORY STORAGE DEVICES	13
II	I/O DEVICES AND INTERFACE	13
III	ASSEMBLING AND CONFIGURE DESKTOP AND CONFIGURE LAPTOPS	13
IV	FUNDAMENTALS OF NETWORKS	13
V	OSI AND TCP/IP PROTOCOLS – SECURITIES	13
Total Instruction Hours		65

UNIT - I**MOTHERBOARD COMPONENTS AND MEMORY STORAGE DEVICES****13 Hrs**

Introduction: Evolution of computers – identify the parts of computer – mother board, expansion slots, memory, power supply, drives and front panel and rear panel connectors – hardware, software and firmware.

Processors: Architecture of CPU and block diagram of multi-core processor – types and features of latest processor

Bus Standards Overview and features of PCI, AGP, USB, PCMCIA, processor BUS – High

Primary Memory: Introduction – main memory, memory – DDR2 – DDR3, RDRAM, cache, virtual memory

Secondary Memory: Hard disk – construction – working principle – specification of IDE, ultra ATA, serial ATA – HDD partition – formatting

Removable Storage: CD & DVD construction – reading & writing operation; construction and working of DVD reader/writer. Disc parameters – recording and play back principles – solid state memory devices – flash drives

Mother Board: Evolution – mother board components – BIOS – CMOS – RAM – form factor – riser architecture – main memory – memory chips (SIMM, DIMM, and RIMM) – extended – expanded – cache – virtual memories

UNIT - II

I/O DEVICES AND INTERFACE

13 Hrs

Keyboard & Mouse, Scanners, Biometric device: Keyboard: signals – operation of membrane and mechanical keyboards, wireless keyboard. mouse – types, connectors, operation of optical mouse, scanners and biometric device

Printers: Introduction – types – dot matrix – ink jet – LASER, line printer, MFP(Multi – Function Printer), thermal printer – operation and construction of printers

I/O Ports: Serial – parallel, USB, game port, Bluetooth interface, IR connector, fire-wire, signal specification problems with interfaces

Displays and Graphics Cards: VGA, SVGA, AGA and HDMI ports – panel displays – principles of LED, LCD and TFT displays

Power Supply: SMPS: Principles of Operation and Block Diagram of ATX Power Supply, connector specifications

UNIT - III

ASSEMBLING AND CONFIGURE DESKTOP AND CONFIGURE LAPTOPS

13 Hrs

Computer assembly: assembling and configure desktop – laptop configuration

Bios Setup: Standard CMOS setup – advanced BIOS setup – power management, advanced chipset features – post

Installing operating system: Purpose of operating system – types of operating system – operating system concepts – installing operating system

Laptop: Common use of laptops – common uses of PDAs and smart phones – components of the laptops – configuring laptops and power settings – ESD and precautions – difference between laptop and desktop

Installing the peripherals: Printers – local printer – network printer – scanners – digital cameras – biometric devices – web cameras

UNIT - IV

FUNDAMENTALS OF NETWORKS

13 Hrs

Network fundamentals: Principle of networking – computer networks – benefits of networks – network architecture

Types of Networks: LAN – MAN – WAN – SAN – client-server – peer to peer networks – Internet – intranet – extranet
Components of the network: Features and concepts of hubs – switches – routers – NIC – MODEM –server – PCs
Configure devices: NIC – switches – routers – MODEMS –servers – types of topology

UNIT - V

OSI AND TCP/IP PROTOCOLS - SECURITIES

13 Hrs

Overview Of TCP/IP & OSI: Benefits of a layered model – TCP/IP model – OSI model – comparing the TCP/IP & OSI model.

Application layer functionality and protocols: Application layer software – application layer protocol functions – HTTP – FTP – DNS – DHCP – TELNET – SMTP – POP

Transport and Network layer protocol: Purpose of transport layer – TCP and UDP – port and port numbers – encapsulation – routing – network layer protocols – routing protocols – anatomy of IPv4

Addressing the Network: Binary to decimal conversion – basic subnetting – subnetting a subnet – Ipv6 –testing the network layer – role of data link layer – purpose of physical layer.

Telephone technologies and Fundamentals of Security: ISP – DIAL UP –ISDN – DSL – cable modem – satellite – security threads – viruses – spyware – DOS – protect data – firewall – antivirus

Text Books:

1. Computer Installation and Servicing by D.Balasubramanian ,Arasan Ganesan Institute of Technology 1993.
2. The complete PC upgrade and Maintenance by Mark Minasi, BPB Publication 1997.

Reference Books:

1. Peter Norton's Inside the PC by Peter Norton, Prince – Hall Computer Publishing
2. The Computer PC upgrade and Maintenance Guide by Mark Minasi, BPB Publications, New Delhi.
3. Troubleshooting, Maintaining and Repairing PCs by Stephen J Bigelow, Tata MCGraw Hill Publication 2004.
4. Computer Networks by Andrew S.Tanenbaum, Prentice – Hall of India, New Delhi 2002.
5. Data Communication and networking by Behrouz A.Forouzan, Tata Mc – Graw Hill, New Delhi 2006.
6. Data and Computer Communications by William Stallings, Prentice – Hall of India, Eighth Edition 2007.

Instruction Hours	65 Hours
Continuous Assessment Test 1, Test 2 & Model Exam	07 Hours
Revision / Discussion	03 Hours
Total	75 Hours

* Pattern of the Question paper (Internal and External) - General Pattern (Theory)

R5-634 ELECTRICAL WORKSHOP PRACTICAL

SUBJECT	INSTRUCTIONS	EXAMINATION
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R5-634 ELECTRICAL WORKSHOP PRACTICAL	Hours / Week	Hours / Sem	Marks			Duration
	5 Hrs	75 Hrs	Internal Assessment	External Exam	Total	
					25	75

LIST OF EXPERIMENTS

1. Study of electrical maintenance
 - a) Preventive and breakdown maintenance
 - b) Production maintenance
 - c) Role of maintenance engineer
2. Study of industrial safety
 - a) Industrial hazard
 - b) Causes of accidents and their prevention
 - c) Protective devices – role of safety engineer
3. Familiarization of tools used for electrical repair works and personal protection equipment.
4. Dismantling of electrical iron box, identifying the parts, checking the conditions, assembling and testing.
5. Dismantling of wet grinder, identifying the parts, checking the conditions, assembling and testing.
6. Dismantling of mixer grinder, identifying the parts, checking the conditions, assembling and testing
7. Assembling the accessories of ceiling fan, test the connections of winding & capacitor and run the fan with speed regulator.
8. Connect the battery and inverter to supply partial load in a domestic wiring during mains failure.
9. Assembling and testing of 15 watts LED light.
10. Wiring, testing and servicing of Fluorescent lamp.
11. Wiring, testing and servicing of Mercury lamp.
12. Design and wind a no volt coil used in Electric Bell.
13. Design and wind 230/12 – 0 – 12 volt, 500mA transformer and test it.
14. Demonstration and trouble shooting of television (LED tv)
15. Demonstration and trouble shooting of Refrigerator.
16. Battery charging from solar panel through charge controller.

Examination Pattern:

Note: All the exercises have to be completed. One exercise will be given for examination. The students are allowed to select the questions by lot. Record notebook should be submitted during the practical examination

Sl. No	Allocation of Marks	Max. Marks
1	Circuit Diagram / Logic Diagram	20
2	Connection and Proceeding the Experiment	25
3	Output / Calculation / Graph / Result	25
4	Viva-voce	05
TOTAL		75 Marks

Theory & practical exercises	60 Hours
Revision / Repetition	15 Hours
Total	75 Hours

R5-635 POWER ELECTRONICS AND DRIVES PRACTICAL

SUBJECT	INSTRUCTIONS		EXAMINATION			Duration
	Hours / Week	Hours / Sem	Marks			
R5-635 POWER ELECTRONICS AND DRIVES PRACTICAL	5 Hrs	75 Hrs	Internal Assessment	External Exam	Total	3 Hrs
			25	75	100	

Experiments:

1. Construct and verify the characteristics of IGBT for the various values of gate voltage.
2. Construct and observe the waveform of Ramp and Pedestal trigger circuit for ac load.
3. Construct single phase half wave controlled rectifier circuits using thyristors and draw the input and output waveforms.
4. Construct single phase full wave controlled rectifier circuits using thyristors and draw the input and output waveforms.
5. Draw the input and output waveforms of single phase half controlled bridge rectifier with resistive load.
6. Draw the input and output waveforms of single phase full controlled bridge rectifier with resistive load.
7. Construct three phase fully controlled bridge converter circuits using thyristors and draw the input and output waveforms
8. Construct three phase half controlled bridge converter circuits using thyristors and draw the input and output waveforms

9. Construct and draw the input and output waveforms of basic series inverter by using thyristors.
10. Construct the IGBT based 1 ϕ multiple pulse (PWM) inverter and draw the input and out wave form waveforms.
11. Construct and verify the MOSFET based PWM chopper.
12. Construct PWM IC based buck converter.
13. Construct and draw the input and output waveforms of 1 ϕ to 1 ϕ cycloconverter with center tapped transformer configuration.
14. PLC based AC drive motor control.

Examination Pattern:

Note: All the exercises have to be completed. One exercise will be given for examination. The students are allowed to select the questions by lot. Record notebook should be submitted during the practical examination

Sl. No	Allocation of Marks	Max. Marks
1	Circuit Diagram / Logic Diagram	20
2	Connection and Proceeding the Experiment	25
3	Output / Calculation / Graph / Result	25
4	Viva-voce	05
TOTAL		75 Marks

Theory & practical exercises	60 Hours
Revision / Repetition	15 Hours
Total	75 Hours

R5-636 SIMULATION PRACTICAL - II

SUBJECT	INSTRUCTIONS		EXAMINATION			Duration
	Hours / Week	Hours / Sem	Marks			
R5-635 SIMULATION PRACTICAL - II	4 Hrs	60 Hrs	Internal Assessment	External Exam	Total	3 Hrs
			25	75	100	

LIST OF EXPERIMENTS

1. a) Square wave generation and sign wave generation
b) Saw tooth wave generation and triangular wave generation
2. Step response of RL & RC series circuits
3. Verification of superposition theorem

4. Verification of Norton’s theorem
5. Verification of Thevenin’s theorem
6. Simulation of half wave rectifier and full wave rectifier
7. Simulation of single phase, half wave converter using SCR with R – load
8. Simulation of single phase, semi converter with RL load
9. Simulation of single phase full converter with RL load
10. Simulation of DC – DC converter
11. Simulation of single phase cycloconverter
12. Simulation of single phase full bridge inverter
13. a) Simulation of three phase star connected balanced load
b) Simulation of three phase star connected unbalanced load
14. a) Simulation of three phase delta connected balanced load
b) Simulation of three phase delta connected unbalanced load
15. a) Generate sinusoidal waveform for a RMS voltage_____V and frequency of _____Hz
b) Generate a complex signal comprising of fundamentals 5th harmonics & 7th harmonics frequency.

Software Required:

Any open Source Software / Mat lab / Pspice / Orcad / Scilab / Octave

Examination Pattern:

Note: All the exercises have to be completed. One exercise will be given for examination. The students are allowed to select the questions by lot. Record notebook should be submitted during the practical examination

Sl. No	Allocation of Marks	Max. Marks
1	Circuit Diagram / Logic Diagram	20
2	Connection and Proceeding the Experiment	25
3	Output / Calculation / Graph / Result	25
4	Viva-voce	05
TOTAL		75 Marks

Theory & practical exercises	50 Hours
Revision / Repetition	10 Hours
Total	60 Hours

R5-637 PROJECT WORK

SUBJECT	INSTRUCTIONS		EXAMINATION			
	Hours / Week	Hours / Sem	Marks			
R5-637 PROJECT WORK	4 Hrs	60 Hrs	Internal Assessment	External Exam	Total	Duration
			25	75	100	

ENTREPRENEURSHIP, ENVIRONMENTAL & DISASTER MANAGEMENT

1. ENTREPRENEURSHIP

1.1 Introduction – Entrepreneur – characteristics of Entrepreneur – contributions of an Entrepreneur – functions of entrepreneur – Barriers to entrepreneurship – Roll of government in Entrepreneurial development.

1.2 Small scale industries (SSI) – SSI role in country's economic growth – importance of SSI -starting of an SSI – Government organization and Non-governmental organizations supporting SSI – DIC, NSIC, SIDO, KVIC, Development banks and their objectives – role of commercial banks in assisting SSI – Women entrepreneurs and opportunities – Subsidy and concessions to Small Scale Industries.

2. ENVIRONMENTAL MANAGEMENT

2.1 Introduction – Environmental Ethics – Assessment of Socio Economic Impact – Environmental Audit – Mitigation of adverse impact on Environment – Importance of Pollution Control – Types of Industries and Industrial Pollution.

2.2 Solid waste management – Characteristics of Industrial wastes – Methods of Collection, transfer and disposal of solid wastes – Converting waste to energy – Hazardous waste management Treatment technologies.

2.3 Waste water management – Characteristics of Industrial effluents – Treatment and disposal methods – Pollution of water sources and effects on human health.

2.4 Air pollution management – Sources and effects – Dispersion of air pollutants – Air pollution control methods – Air quality management.

2.5 Noise pollution management – Effects of noise on people – Noise control methods.

3. DISASTER MANAGEMENT

3.1 Introduction – Disasters due to natural calamities such as Earthquake, Rain, Flood, Hurricane, Cyclones etc – Man-made Disasters – Crisis due to fires, accidents, strikes etc – Loss of property and life.

3.2 Disaster Mitigation measures – Causes for major disasters – risk identification – Hazard Zones – selection of sites for Industries and residential buildings – minimum distances from Sea – orientation of buildings – stability of structures – fire escapes in buildings – Cyclone shelters – Warning systems.

3.3 Disaster Management – Preparedness, Response, Recovery – Arrangements to be made in the industries / factories and buildings – Mobilization of Emergency Services – Search and Rescue operations – First Aids – Transportation of affected people – Hospital facilities – Fire fighting arrangements – Communication systems – Restoration of Power supply – Getting assistance of neighbours / other organizations in recovery and

rebuilding works – Financial commitments – Compensations to be paid – Insurances – Rehabilitation.

LIST OF QUESTIONS

1. ENTREPRENEURSHIP

1. Define the term Entrepreneur.
2. What is Entrepreneurship? Explain.
3. List the various stages of decisions an entrepreneur has to make before reaching the goal.
4. What is innovation?
5. State briefly the role of an entrepreneur in the economic growth of a country.
6. List the characteristics of an Entrepreneur.
7. What are the critical elements of an Entrepreneur?
8. State the major functions of an Entrepreneur.
9. What are barriers to Entrepreneurship?
10. Define Small Scale Industry.
11. What are the qualities of Entrepreneur?
12. What are the benefits of Entrepreneur?
13. What are the various SSI that can flourish in your district?
14. Identify the infrastructural needs for an industry.
15. What are the various agencies involved in the establishment and development of SSI?
16. Name some of the agencies funding SSI.
17. Explain the roles played by Government in Entrepreneurial development.
18. What are the various concessions and incentives available for a SSI.
19. Name some consumer products with demand that can be manufactured by a SSI?
20. What is feasibility study?
21. What is the importance of SSI?
22. What is DIC? State its functions.
23. What is NSIC? State its functions.
24. What is SIDO? State its functions.
25. Name the Development Banks in India working towards Entrepreneurial development.
26. State the role of commercial bank in assisting SSI sector.
27. What are the different phases of Entrepreneurial Development programme?
28. What is an Industrial Estate?
29. What are the facilities available in an Industrial Estate?
30. Identify the various training agencies associated with SSI.
31. List the govt. agencies from whom you shall get financial assistance for a SSI.
32. What is KVIC? State its objectives.
33. Name some state finance corporations.
34. What are the steps involved in preparing a feasibility report?
35. What are the factors to be considered regarding raw materials for a SSI?
36. What are the features of a SSI?
37. What are the advantages of becoming an Entrepreneur?
38. Name the Organizations offering assistance for the development of Women entrepreneurs.
39. State the business opportunities for Women entrepreneurs.
40. State the different subsidies given to SSI's.

2. ENVIRONMENTAL MANAGEMENT

1. What is the responsibility of an Engineer of an Industry with respect to Public Health?
2. Define Environmental Ethic.
3. How Industries play their role in polluting the environment?
4. What is the necessity of pollution control?
5. List out the different types of pollutions caused by a Chemical / Automobile / Cement factory.
6. What is meant by Hazardous waste?
7. Define Industrial waste management.

8. Differentiate between garbage, rubbish, refuse and trash based on composition and source.
9. Explain briefly how the quantity of solid waste generated in an industry could be reduced.
10. What are the objectives of treatments of solid wastes before disposal?
11. What are the different methods of disposal of solid wastes?
12. Explain how the principle of recycling could be applied in the process of waste minimization.
13. Define the term 'Environmental Waste Audit'.
14. List and discuss the factors pertinent to the selection of landfill site.
15. Explain the purpose of daily cover in a sanitary landfill and state the minimum desirable depth
16. Describe any two methods of converting waste into energy.
17. What actions, a local body such as a municipality could take when the agency appointed for collecting and disposing the solid wastes fails to do the work continuously for number of days?
18. Write a note on Characteristics of hazardous waste.
19. What is the difference between municipal and industrial effluent ?
20. List few of the undesirable parameters / pollutants anticipated in the effluents from oil refinery industry / thermal power plants / textile industries / woolen mills / dye industries / electroplating industries / cement plants / leather industries (any two may be asked)
21. Explain briefly the process of Equalization and Neutralization of waste water of varying characteristics discharged from an Industry.
22. Explain briefly the Physical treatments "Sedimentation" and "Floatation" processes in the waste water treatment.
23. Explain briefly when and how chemical / biological treatments are given to the waste water.
24. List the four common advanced waste water treatment processes and the pollutants they remove.
25. Describe refractory organics and the method used to remove them from the effluent.
26. Explain biological nitrification and de-nitrification.
27. Describe the basic approaches to land treatment of Industrial Effluent.
28. Describe the locations for the ultimate disposal of sludge and the treatment steps needed prior to ultimate disposal.
29. List any five Industries, which act as the major sources for Hazardous Air Pollutants.
30. List out the names of any three hazardous air pollutants and their effects on human health.
31. Explain the influence of moisture, temperature and sunlight on the severity of air pollution effects on materials.
32. Differentiate between acute and chronic health effects from Air pollution.
33. Define the term Acid rain and explain how it occurs.
34. Discuss briefly the causes for global warming and its consequences
35. Suggest suitable Air pollution control devices for a few pollutants and sources.
36. Explain how evaporative emissions and exhaust emissions are commonly controlled.
37. What are the harmful elements present in the automobile smokes? How their presence could be controlled?
38. What is the Advantage of Ozone layer in the atmosphere?
39. Explain the mechanism by which hearing damage occurs.
40. List any five effects of noise other than hearing damage.
41. Explain why impulsive noise is more dangerous than steady state noise.
42. Explain briefly the Source – Path – Receiver concept of Noise control.
43. Where silencers or mufflers are used ? Explain how they reduce the noise.
44. Describe two techniques to protect the receiver from hearing loss when design / redress for noise control fail.
45. What are the problems faced by the people residing along the side of a railway track and near to an Airport? What provisions could be made in their houses to reduce the problem?

3. DISASTER MANAGEMENT

1. What is meant by Disaster Management? What are the different stages of Disaster management?
2. Differentiate Natural Disasters and Man made Disasters with examples.
3. Describe the necessity of Risk identification and Assessment Surveys while planning a project.
4. What is Disasters recovery and what does it mean to an Industry?

5. What are the factors to be considered while planning the rebuilding works after a major disaster due to flood / cyclone / earthquake? (Any one may be asked)
6. List out the public emergency services available in the state, which could be approached for help during a natural disaster.
7. Specify the role played by an Engineer in the process of Disaster management.
8. What is the cause for Earthquakes? How they are measured? Which parts of India are more vulnerable for frequent earthquakes?
9. What was the cause for the Tsunami 2004 which inflicted heavy loss to life and property along the coast of Tamilnadu ? Specify its epicenter and magnitude.
10. Specify the Earthquake Hazard Zones in which the following towns of Tamilnadu like: (a) Chennai (b) Nagapattinam (c) Coimbatore (d) Madurai (e) Salem.
11. Which parts of India are experiencing frequent natural calamities such as (a) heavy rain fall (b) huge losses due to floods (c) severe cyclones
12. Define basic wind speed. What will be the peak wind speed in (a) Very high damage risk zone – A, (b) High damage risk zone, (c) Low damage risk zone.
13. Specify the minimum distance from the Sea shore and minimum height above the mean sea level, desirable for the location of buildings.
14. Explain how the topography of the site plays a role in the disasters caused by floods and cyclones.
15. Explain how the shape and orientation of buildings could reduce the damages due to cyclones.
16. What is a cyclone shelter? When and where it is provided? What are its requirements?
17. What Precautionary measures have to be taken by the authorities before opening a dam for discharging the excess water into a canal/river?
18. What are the causes for fire accidents? Specify the remedial measures to be taken in buildings to avoid fire accidents.
19. What is a fire escape in multistoried buildings? What are its requirements?
20. How the inmates of a multistory building are to be evacuated in the event of a fire/Chemical spill/Toxic Air Situation/ Terrorist attack, (any one may be asked).
21. Describe different fire fighting arrangements to be provided in an Industry.
22. Explain the necessity of disaster warning systems in Industries.
23. Explain how rescue operations have to be carried out in the case of collapse of buildings due to earthquake / blast / Cyclone / flood.
24. What are the necessary steps to be taken to avoid dangerous epidemics after a flood disaster?
25. What relief works that have to be carried out to save the lives of workers when the factory area is suddenly affected by a dangerous gas leak / sudden flooding?
26. What are the difficulties faced by an Industry when there is a sudden power failure? How such a situation could be managed?
27. What are the difficulties faced by the Management when there is a group clash between the workers? How such a situation could be managed?
28. What will be the problems faced by the management of an Industry when a worker dies because of the failure of a mechanical device due to poor maintenance? How-to manage such a situation ?
29. What precautionary measures have to be taken to avoid accidents to labourers in the Industry in a workshop / during handling of dangerous Chemicals / during construction of buildings / during the building maintenance works.
30. Explain the necessity of medical care facilities in an Industry / Project site.
31. Explain the necessity of proper training to the employees of Industries dealing with hazardous products, to act during disasters.
32. What type of disaster is expected in coal mines, cotton mills, Oil refineries, ship yards and gas plants?
33. What is meant by Emergency Plan Rehearsal? What are the advantages of such Rehearsals?
34. What action you will take when your employees could not reach the factory site because of continuous strike by Public Transport workers?

35. What immediate actions you will initiate when the quarters of your factory workers are suddenly flooded due to the breach in a nearby lake / dam, during heavy rain?
36. What steps you will take to avoid a break down when the workers union of your Industry have given a strike notice?
37. List out few possible crisis in an organization caused by its workers? What could be the part of the middle level officials in managing such crisis?
38. What types of warning systems are available to alert the people in the case of predicted disasters, such as floods, cyclone etc.
39. Explain the necessity of Team work in the crisis management in an Industry / Local body.
40. What factors are to be considered while fixing compensation to the workers in the case of severe accidents causing disability / death to them?
41. Explain the legal / financial problems the management has to face if safety measures taken by them are found to be inadequate.
42. Describe the importance of insurance to men and machinery of an Industry dealing with dangerous jobs.
43. What precautions have to be taken while storing explosives in a match/ fire crackers factory?
44. What are the arrangements required for emergency rescue works in the case of Atomic Power Plants?
45. Why residential quarters are not constructed nearer to Atomic Power Plants?

Examination Pattern:

Internal Assessment:

The internal assessment should be calculated based on the review of the progress of the work done by the student periodically as follows.

Details of assessment	Period of assessment	Max. Marks
First Review	06 th week	10
Second Review	12 th week	10
Attendance	Entire semester	05
Total		25

End Semester Exam:

Details of Mark Allocation	Max Marks
Report Preparation, Demo, Viva-voce	60 Marks
4 questions from each topic in question bank consisting of Entrepreneurship, Environmental Management and Disaster Management will be asked. Out of four questions the students have to write any two questions from each topic. 2 questions x 3 topics = 6 questions (6 x 2 ½ = 15 Marks)	15 Marks
Total	75 Marks

A neatly prepared PROJECT REPORT in the following format has to be submitted individually during the Project Work & Viva-voce Autonomous examination.

FORMAT FOR PREPARATION OF PROJECT REPORT

1. ARRANGEMENT OF CONTENTS:

The sequence in which the project report material should be arranged and bound should be as follows:

1. Cover Page & Title Page

2. Bonafide Certificate
3. Abstract
4. Table of Contents
5. List of Tables
6. List of Figures
7. List of Symbols, Abbreviations and Nomenclature
8. Chapters
9. Appendices
10. References

The table and figures shall be introduced in the appropriate places.

2. PAGE DIMENSION AND BINDING SPECIFICATIONS:

The dimension of the project report should be in A4 size. The project report should be bound using flexible cover of the thick white art paper. The cover should be printed in black letters and the text for printing should be identical.

3. PREPARATION FORMAT:

- 3.1 **Cover Page & Title Page:** A specimen copy of the Cover page & Title Page and Bonafide Certificate of the project report will be given in Appendix - I and Appendix - II.
- 3.2 **Bonafide Certificate:** The Bonafide Certificate shall be in double line spacing using Font Style Times New Roman and Font Size 14. The certificate shall carry the Guide's signature and shall be followed by the guide's name, Academic designation (not any other responsibilities of administrative nature), Department and full address of the Institution. The term 'GUIDE' must be typed in capital letters between the Guide's name and academic designation.
- 3.3 **Abstract:** Abstract should be one page synopsis of the project report typed in double line spacing, Font Style Times New Roman and Font Size 14.
- 3.4 **Table of Contents:** The table of contents should list all material following it as well as any material which precedes it. The title page and Bonafide Certificate will not find a place among the items listed in the Table of Contents but the page numbers of which are in lower case Roman letters. One and a half spacing should be adopted for typing the matter under this head.
- 3.5 **List of Tables:** The list should use exactly the same captions as they appear above the tables in the text. One and a half spacing should be adopted for typing the matter under this head.
- 3.6 **List of Figures:** The list should use exactly the same captions as they appear below the figures in the text. One and a half spacing should be adopted for typing the matter under this head.
- 3.7 **List of Symbols, Abbreviations and Nomenclature:** One and a half spacing should be adopted or typing the matter under this head. Standard symbols, abbreviations etc. should be used.
- 3.8 **Chapters:** The chapters may be broadly divided into 3 parts
 - (I) Introductory chapter
 - (II) Chapters developing the main theme of the project work such as

1. Objectives
2. Collection of data and required survey work
3. Management and construction procedure
4. Resources scheduling and networking
5. Design details
6. Required drawing set
7. Utility to society if any, and

(III) Conclusion.

The main text will be divided into several chapters and each chapter may be further divided into several divisions and sub-divisions. Each chapter should be given an appropriate title.

Tables and figures in a chapter should be placed in the immediate vicinity of the reference where they are cited.

Footnotes should be used sparingly. They should be typed single space and placed directly underneath in the very same page, which refers to the material they annotate.

3.9 Appendices: Appendices are provided to give supplementary information, which is included in the main text may serve as a distraction and cloud the central theme.

- Appendices should be numbered using Arabic numerals, e.g. Appendix 1, Appendix 2, etc.
- Appendices, Tables and References appearing in appendices should be numbered and referred to at appropriate places just as in the case of chapters.
- Appendices shall carry the title of the work reported and the same title shall be made in the contents page also

3.10 Table and figures: By the word Table, is meant tabulated numerical data in the body of the project report as well as in the Appendices. All other non-verbal materials used in the body of the project work and appendices such as charts, graphs, maps, photographs and diagrams may be designated as figures.

3.11 List of References: The listing of references should be typed 4 spaces below the heading "REFERENCES" in alphabetical order in single spacing left-justified. The reference material should be listed in the alphabetical order of the first author. The name of the author / authors should be immediately followed by the year and other details.

Eg: 1. Neville, A. M., Concrete Technology, Fourth edition, Pearson Education, New Delhi.

4. TYPING INSTRUCTIONS:

The impression on the typed copies should be black in colour. One and a half spacing should be used for typing the general text. The general text shall be typed in the Font style 'Times New Roman' and Font size 12.

APPENDIX - I

(A typical Specimen of Cover Page & Title Page)

TITLE OF PROJECT REPORT

<1.5 line spacing>

A PROJECT REPORT

Submitted by

<Italic>

NAME OF THE CANDIDATE(S)

*Submitted for partial fulfillment of requirement for the award of the Diploma
in*

<1.5 line spacing><Italic>

BRANCH OF STUDY



**SRI RAMAKRISHNA MISSION
VIDYALAYA POLYTECHNIC COLLEGE**

<1.5 line spacing>

(AN AUTONOMOUS & ISO 9001:2008 CERTIFIED INSTITUTION)

Sri Ramakrishna Vidyalaya Post, Coimbatore – 641 020

☎ 0422-2692432 ♦ E-mail: srkvtech56@gmail.com

Fax: (0422) 2692582 ♦ Website: www.srkv.org

MONTH & YEAR

APPENDIX - II

(A typical specimen of Bonafide Certificate)

**SRI RAMAKRISHNA MISSION
VIDYALAYA POLYTECHNIC COLLEGE
COIMBATORE – 641 020**

BONAFIDE CERTIFICATE

Certified that this project report entitled “.....**TITLE OF THE PROJECT.....**” is the bonafide work done by “.....**NAME OF THE CANDIDATE.....**” with his batch-mates, in partial fulfillment of the requirement for the award of Diploma in **BRANCH OF STUDY.....** under my guidance.

<<Signature of the Head of the Department>>

<<Signature of the Guide>>

SIGNATURE

<<Name>>

HEAD OF THE DEPARTMENT

<<Academic Designation>>

<<Department>>

SIGNATURE

<<Name>>

GUIDE

<<Academic Designation>>

<<Department>>

Submitted for Autonomous Examination held on

INTERNAL EXAMINER

EXTERNAL EXAMINER