



**SYLLABUS FOR DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING
 M7-SCHEME**

Programme Name : Diploma in Electrical and Electronics Engineering
 Course Code : **M7EE309**
 Term : VI Term
 Course Title : **DISTRIBUTION AND UTILIZATION**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per Term: 16

Course and course code	Instruction		Examination		Total
	Hours / Week	Hours / Term	Assessment		
			Internal Assessment	End Examination	
DISTRIBUTION AND UTILIZATION M7EE309	6	96	25	75	100

TOPICS AND ALLOCATION OF TIME

UNIT	TOPIC	TIME (Hours)
I	Distribution	18
II	Industrial Drives	16
III	Electric Traction	16
IV	Illumination	18
V	Electric Heating & Welding	16
	Revision & Test	12
	TOTAL	96

RATIONALE

Distribution system is that part of power system which distributes power to the consumers for utilisation. So to have adequate knowledge in distribution and utilization of Electrical energy it becomes necessary to include this course.

OBJECTIVES

To Understand

- x Substation arrangements
- x Distribution -classification and scheme of connection x Drives- Suitability for different applications x Track Electrification-Traction mechanics x Traction motors and control
- x Illumination -Design of lighting scheme-sources of light



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x Electric Heating- Different methods.

x Electric furnaces and Temperature control x Electric welding and welding equipments

**M7EE309 DISTRIBUTION AND UTILIZATION
DETAILED SYLLABUS**

Contents : Theory

Unit	Name of the Topic	Hours	Marks
I	<p>DISTRIBUTION</p> <p>Substation: Introduction-Sub stations-classification of sub stations-Indoor and outdoor S.S - Gas insulated S.S-comparisons-Layout 110/11KV Substation and 11KV/400V Distribution Substation-substation equipments-Busbar- Types of busbar arrangement -Advantages and Disadvantages.</p> <p>Distribution: Distribution system-Requirements of a Distribution system-parts of Distribution system-Classification of Distribution systems-comparison of different distribution systems (A.C and D.C) -A.C Distribution -Types-connection schemes of Distribution system-A. C 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)</p>	18	15
II	<p>UNIT II- INDUSTRIAL DRIVES</p> <p>Introduction-Electric drive- Advantages-parts of Electric drives- Transmission of power-Types of Electric drives-Individual, group and multimotor drives - Advantages and disadvantages of Individual and group drive -Factors governing the selection of motors-Nature and classification of load Torque-Matching of speed Torque characteristics of load and motor-Standard ratings of motor- classes of load duty cycles-Selection of motors for different duty cycles-Selection of motors for specific application-Braking- Features of good braking system- Types of Braking-Advantages of- Electric braking-Plugging, Dynamic and Regenerative braking-As applied to various motors.</p>	16	15
III	<p>ELECTRIC TRACTION</p> <p>Introduction-Traction systems-Advantages and Disadvantages of Electric Traction.</p> <p>System of Track Electrification: Methods of supplying power-Rail connected system and over head system-O.H. 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 A. C. system-Booster Transformer-Necessity- Methods of connecting B.T-Neutral sectioning.</p> <p>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.</p>	16	15

Unit	Name of the Topic	Hours	Marks
	<p>Traction motors and control: Desirable characteristics of Traction motors-Motors used for Traction purpose-Methods of starting and speed control of D.C Traction motors-Rheostatic Control-energy saving with plain rheostatic control-series-parallel control- Energy saving with series parallel starting - Shunt Transition -Bridge-Transition- Drum control-contactor type bridge Transition controller –Metadyne control-multiple unit control -Regenerative braking.</p> <p>Recent trends in Electric Traction-Magnetic Levitation (MEGLEV)- Suspension systems</p>		
IV	<p>ILLUMINATION Introduction - Definition and units of different terms used in illumination-plane Angle, Solids angle, Light,. Luminous flux, Luminous Intensity, Luminous Efficacy candle power, Lumen, Illumination, M.S.C.P, M.H.C.P, M.H.S.C.P- Reduction factor, Luminance, glare Lamp efficiency. Space-height ratio, Depreciation factor Utilization factor, waste light factor, Absorption factor, Beam factor, Reflection factor- Requirements of good lighting system- Laws of Illumination-problems. Types of lighting scheme- Factors to be considered while designing lighting scheme- Design of lighting Scheme (Indoor and outdoor)- Problems- Lighting systems- Factory lighting, Flood lighting, Street lighting.</p> <p>Sources of light-Arc lamp, Incandescent lamp, Halogen Lamp, Sodium vapour lamp, High pressure mercury vapour lamp, Fluorescent Tube - Stroboscopic Effect - Energy saving lamps (C.F.L and L.E.D lamps)- - Energy saving consideration for fluorescent lamp.</p>	18	15
V	<p>ELECTRIC HEATING AND WELDING 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.</p> <p>Electric furnaces: Resistance furnace-Requirements of Heating elements-commonly usedheating element materials-Resistance furnace for special purposes-Temperature control of resistance furnace-Arc furnace -Direct and Indirect Arc furnace- Temperature control of Arc furnace-Reasons for employing low voltage and high current supply - Induction furnace-Direct and Indirect core type Induction furnace-coreless Induction furnace-Power supply for coreless Induction furnace.</p> <p>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-Arc welding-Carbon Arc welding,metal Arc welding, Atomic hydrogen Arc welding, Inert gas metal arc welding-Comparison between Resistance and Arc welding. Radiation welding - Ultrasonic welding, Electron beam welding, LASER beam welding-Electric welding equipments (A.C. and D.C).</p>	16	15

REFERENCE BOOKS

Sl.No.	Name of the Book	Author	Publisher
1	A Course in Electrical Power	JBGupta	Katson Publishing House, New Delhi
2	Electric Power,	SL Uppal	Khanna Publishers, New Delhi
3	A Textbook in Electric Power	Soni& Gupta,	Dhanpat Rai & Sons, Delhi
4	Modern Electric Traction	H Partab,	Dhanpat Rai & Sons, New Delhi
5	Electrical Power Distribution System	AS Pabla,	Tata McGraw Hill Publishing Co, New Delhi
6	Fundamentals of Electrical Drives	GK Bubey,	Narosa Publishing House, New Delhi
7	Utilization of Electric Power	NV Suryanarayana,	Tata McGraw Hill Publishing Co, New Delhi
8	Electric Drives	Vedam Subramaniam,	New Age International, New Delhi

**DISTRIBUTION AND UTILIZATION
MODEL QUESTION PAPER – 1**

Time: 3 Hrs

Max. Marks: 75

- Note: (i) Part 'A' Questions carry 1 mark each and answer for any 15 questions.
(ii) Part 'B' questions carry 12 marks each and answer all questions by selecting 'either' or 'OR'*

PART 'A'

1. What is Indoor Substation?
 2. Name the types of busbar arrangement.
 3. List any two advantages of Ring busbar system
 4. Write the use of Instrument transformer in substation.
 5. Give any two advantages of Electric drives.
 6. What is multi motor drive?
 7. What is continuous rating?
 8. Give any two advantages of Electric braking.
 9. Give any two requirements of Ideal traction system
 10. What are the methods of supplying power to electric traction?
 11. What is tractive effort?
 12. Give any two advantages of regenerative braking
 13. Define space height ratio
 14. Define Depreciation factor
 15. Define Illumination
 16. What is stroboscopic effect?
 17. Give any two advantages of Electric heating
 18. What is meant by direct resistance heating?
 19. Give any two requirements of heating elements
 20. What are the types of Arc welding
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PART 'B'

21 a. Diagrammatically represent the layout of a typical 110 KV / 11 KV substation with all details.

(OR)

b. Compare the volume of conductor materials required in Three phase, four wire system with D.C. two wire with one conductor earthed.

22 a. Explain with necessary sketch, matching of speed – Torque characteristics of load and motor.

(OR)

b. Explain how regenerative braking is applied to D.C. Series and shunt motor.

23 a. List the disadvantages of single phase low frequency A.C. traction system.

b. Write short notes on Pantograph collector

(OR)

c. With an illustration explain the function of Booster Transformer in traction.

d. Explain plain Rheostatic method of starting D.C. traction motors.

24 a. State and prove two laws of illumination

(OR)

b. Explain with a sketch working of sodium vapour lamp.

25. a. With a neat sketch explain ajax-wyatt vertical core type furnace

(OR)

b. Explain Electron beam welding

**DISTRIBUTION AND UTILIZATION
MODEL QUESTION PAPER – 2**

Time: 3 Hrs

Max. Marks: 75

- Note: (i) Part 'A' Questions carry 1 mark each and answer for any 15 questions.
(ii) Part 'B' questions carry 12 marks each and answer all questions by selecting 'either' or 'OR'*

PART 'A'

1. What is outdoor substation?
 2. List any two advantages of double busbar arrangement.
 3. Classify the distribution system based on character of service voltage
 4. What is Power factor correction substation?
 5. What is individual drive?
 6. Name any two types of enclosures used in drives
 7. What is Intermittent rating?
 8. What is meant by plugging?
 9. Write any two advantages of Electric Traction.
 10. What is Neutral section?
 11. What is adhesive weight?
 12. What is the purpose of catenary in overhead equipments?
 13. What is luminous efficacy?
 14. What is the advantage of C.F.L. over fluorescent tube?
 15. Give any two requirements of good lighting system.
 16. What is meant by semi-direct lighting?
 17. What is convection mode of heat transfer?
 18. List any two applications of dielectric heating.
 19. Give any two materials used for Heating element?
 20. What type of D.C. Generator is used in welding and why?
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PART -B

21 a. Draw and explain double bus bar arrangement and list its advantages

(OR)

b. A single phase distributor has loop resistance of 0.3 ohm and a reactance of 0.4 ohm. The far end of the distributor has a load current of 80 A and power factor 0.8 lagging at 220 V. The mid-point 'C' of the distributor has a load current of 50 A at power factor 0.707 lagging with reference to voltage 'C'. Calculate the sending end voltage and power factor.

22 a. Explain different types of drives used in Industrial loads.

(OR)

b. Choose the motor suitable for the following applications. Give reasons for your choice.

(i) Cement mill (ii) Belt conveyors (iii) Centrifugal pump (iv) Lift and hoists (v) Rolling mill (vi) Paper mill

23 a. Derive from basic principles for the crest speed using trapezoidal speed time curve, State all your assumptions clearly with relevant units.

(OR)

b. Explain contactor type bridge transition controller.

24 a. What are the requirements of good lighting system

b. Explain stroboscopic effect and how it is eliminated in fluorescent tube light.

(OR)

c. Explain the principle of an incandescent lamp.

d. Explain the factors to be considered while designing lighting schemes.

25 a. Explain Dielectric heating and Eddy current heating

(OR)

b. Write short notes on (i) butt welding (ii) Spot welding (iii) Seam welding (iv) projection welding (v) Flash welding

**SYLLABUS FOR DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING
M7-SCHEME**

Programme Name : Diploma in Electrical and Electronics Engineering
 Course Code : M7EE310
 Term : VI Term
 Course Title : **ELECTRICAL ESTIMATION AND ENERGY AUDITING**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per Term: 16

Course and course code	Instruction		Examination		Total
	Hours / Week	Hours / Term	Assessment		
			Internal Assessment	End Examination	
ELECTRICAL ESTIMATION AND ENERGY AUDITING M7EE310	5	80	25	75	100

TOPICS AND ALLOCATION OF TIME

UNIT	TOPIC	TIME (Hours)
I	Systems of Internal Wiring, Wire size, Fuses, Earthling and Testing of installation	14
II	Domestic, Commercial and Industrial Installation Estimate	13
III	General Aspects of Energy Auditing Squirrel Cage Motors	15
IV	Transformers and Cables	13
V	Lighting and Pumping Systems	13
	REVISION AND TEST	12
	TOTAL	80

**M7EE310 ELECTRICAL ESTIMATION AND ENERGY AUDITING
DETAILED SYLLABUS**

Contents : Theory

Unit	Name of the Topic	Hours	Marks
I	<p>Systems of Internal Wiring, Wire size, Fuses, Shock, Earthing and Testing of installation</p> <p>Conventional symbols for various wiring items, accessories etc. A brief study of important Indian Electricity Rules (1956)</p> <p>Internal wiring, Wire size, Fuses, Shock</p> <p>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 house holds electrical appliances – selection of Fuses.</p> <p>Earthing and Testing of Installation</p> <p>Necessity - different methods - pipe earthing and plate earthing</p> <p>- materials required - requirements of good earth electrode neutral wire - difference between neutral wire and earth wire - connection with earth - value of earth resistance and factors on which it is dependent - points to be remembered while providing earth - ELCB system - Earthing of domestic fitting and appliances - Industrial Earthing - Substation Earthing.</p> <p>Insulation Resistance test between earth and conductor and between conductor - Leakage test - Insulation Resistance of motors and other equipment - Factors to be considered for checking electrical installations - Testing of wiring installation: introduction, verification of polarity, effectiveness of earthing, insulation resistance, earth resistance- periodical testing - testing of UG cable - Guidelines for installation of fitting switches, light, fans, earthing of appliances and electrical machines.</p>	14	15
II	<p>Domestic, Commercial and Industrial Installation Estimate</p> <p>Conditions and Requirements for Domestic, Commercial and Industrial Installation - steps to be followed in preparing electrical estimate (domestic, industrial and agricultural installation)</p>	13	15

Unit	Name of the Topic	Hours	Marks
	<p>Estimate the quantity of material required for</p> <p>(1) Residential single bed room Flat (1BHK). (2) Industrial power wiring having 4 or 5 machines. (3) Erection of one no. 15hp induction motor in Saw mill / Flour mill. (4) Irrigation Pump motor (5hp) wiring. (5) Computer centre having 10 computers, a/c unit, UPS, light and fan. (6) Street Light service having 12 lamp light fitting</p>		
III	<p>General Aspects of Energy Auditing</p> <p>Introduction - Types of Energy Auditing - Benefits of Energy Audit - Requirements to conduct Energy Audit - Methodology for Energy Audit - Energy Audit Report – Energy Conservation Building Code.</p> <p>Squirrel Cage Motors</p> <p>Operation of Induction Motor - Special Design feature for high efficiency motor - Torque - Speed Characteristics - Operating parameters of motor - Losses - Measurement of efficiency - Determination of energy saving - determination of Load - Assessment of economic feasibility - choice of energy efficient motor - Effect of variation of voltage on the performance of motor - effect of load variations on efficiency and power factor - unbalanced phase voltage - insulation system.</p>	15	15
IV	<p>Transformers and Cables</p> <p>Transformers</p> <p>Introduction - Transformer Losses - Fixed Losses - Load Losses. Evaluation of Transformer Losses - Case Studies - reduction in Transformer Losses. Energy Conservation Building Code - mandatory requirements - maximum allowable power transformer losses.</p> <p>HT and LT Cables</p> <p>Introduction- Selection of Cable - Construction - Insulation - inner sheath - armouring - outer sheath - specifications - Tests- Installation. Economics in selection of cables.</p>	13	15

Unit	Name of the Topic	Hours	Marks
V	<p>Lighting and Pumping Systems</p> <p>Lighting Systems</p> <p>Colour Rendering Index (CRI), Aspects of Lighting System Designing. Installed Load Efficacy Ratio. Various means for Energy Saving - use of natural day light - reduction in light fixture - high efficiency lamps and luminaries - effect of reduction in supply voltage - electronic ballasts - timers and occupancy sensors - Fluorescent tube lights - CFL lamps - Lighting Control - Exterior Lighting control - Interior Lighting power - Installed Interior Lighting Power - Exterior Lighting Power.</p> <p>Pumping Systems</p> <p>Centrifugal Pumps - Pumping System characteristics - static head vs Flow. Pump curves - pump operating point - Factors affecting pump performance - Matching pump and system head-flow characteristics - effect of over sizing the pump - energy loss in throttling. Efficient pumping system operation - effect of speed variation - effects of impeller diameter change - pump suction performance. Flow Control Strategies - pump control by varying speed - Pumps in parallel switched to meet demand- Stop/Start Control - Flow Control Valve - By-pass control - Fixed Flow reduction - Variable Frequency Drives. Energy Conservation Opportunities in Pumping Systems.</p>	13	15

TEXT BOOK

Sl No.	Title	Author(s)	Publishers	Edition	Year
1	Electrical Wiring, Estimating and Costing	Dr.S. L.U ppal.	Khanna Publishers.		
2	Electrical Design Estimating and Costing.	K.B.Raina & S.K.Battacharya.	New age international (p) limited. Publishers		
3	Energy Auditing in Electrical Utilities	Rajiv Shankar.	Viva Books	First	2010
4	ENERGY ENGINEERING AND MANAGEMENT	AMLAN CHAKRABARTI	PHI Learning Pvt Ltd	Second Printing	2011

ELECTRICAL ESTIMATION AND ENERGY AUDITING

Model question paper – I

Time : 3 Hrs.

Max. Marks: 75

Note: Part A questions carry each 1 mark and answer any Fifteen questions.

Part B questions carry each 12 marks and answer all questions by selecting either “a” or “b”. Part– A

1. What are the various types of wiring used in wiring installation? Explain any one briefly. 2. What are the factors to be considered while determining the size of conductors? 3. State the difference between Neutral and Earth wires?
4. Describe the method of plate earthing?
5. What is meant by testing of installation ? Explain any one of the testing? 6. Explain the points to be remembered while providing earth.
7. Write a note on guidelines for installation of switches ,lights & fans
8. Differentiate between Domestic and Industrial consumers.
9. What is Energy Audit?
10. What are the different types of Energy Audit?
11. What are the points covered in an Energy Audit Report?
12. Classify the Loads for induction motors in the industries with examples
13. What are the various losses in Transformer?
14. What are the aspects to be considered in selection of the Cables
15. Differentiate between Power cables and Control Cables.
16. What are the different tests conducted on cables?
17. Distinguish between Lux and Lumens
18. Compare CFL lamps with other lamp types in terms of energy saving.
19. Draw the Characteristics curves of a pumping system.
20. What are the effects of over sizing the Pumps?

PART- B

- 21 .a. Explain in detail Looping Back, Joint Box and Tree systems with diagrams. **OR**
b. Explain the requirements of a good earthing system.
22. a. A residential building is to be electrified with surface PVC conduit concealed type of wiring Give the schedule of material. The details of fittings are as follows:

Name of the Room	Size	No. of Tube lights	No . of Fans	No. of ordinary lamps	No .of Plugs
Drawing Room	5m*6m	2	1	1	1
Kitchen	2m*4m	1	1	-	1
Bed Room	4m*4m	1	1	1	1
Bath Room	1m*1m	-	-	1	1
Toilet	1m*1m	-	-	1	-

Assume necessary data as per IE rules and mentioned them clearly. **OR**

- b. Workshop of size 25m*10m . A 15HP, 400V,50 Hz induction motor has to be installed for running a saw mill. Estimate the quantity of materials required with their specification. Assume surface metal conduit wiring and necessary data as per the IE rules.

23.a. Explain the Methodology for Energy Audit **OR**

- b. A 50 KW induction motor with 86% present full load efficiency is being considered for replacement by an 89% efficiency motor. What will be the savings in Energy if the motor works for 6000 Hrs. per year and cost of energy is Rs.4 .50/KWh?

24. a. Which of the following Transformers is preferable?

Life of both the transformers is 15 years and the transformer remains on load for 8500 Hrs. in a year. Energy cost is Rs.5.25.

	Transformer-I	Transformer-II
Purchase Price	Rs. 3 Lacs	Rs.3.15 Lacs
No Load Losses	1650W	1450W
Load Losses	9500 W	7500 W
Efficiency at rated Capacity	70 %	70 %

OR

- b. Explain the Economics involved in the Selection of Cables.

25. a. Explain the Characteristics of Different types of Lamps. **OR**

- b. Explain Energy conservation opportunities in pumping systems.
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ELECTRICAL ESTIMATION AND ENERGY AUDITING

Model question paper – II

Time : 3 Hrs.

Max. Marks: 75

Note: Part A questions carry each 1 mark and answer any Fifteen questions.

Part B questions carry each 12 marks and answer all questions by selecting either “a” or “b”.

Part– A

1. Describe the method of measuring insulation resistance of an installation?
2. What is meant by wiring & Explain any two methods of wiring? 3. Explain any two types of fuses used in electrical installation?
4. What is service connection? Explain how underground service connections are given to the consumer?
5. What are the requirements for a domestic electrical installation?
6. Briefly explain the steps involved in preparing electrical estimate for industrial consumers.
7. Differentiate between Commercial and Industrial consumers.
8. List the exclusive aspects of industrial electrical installations.
9. What are the benefits from Energy Audit?
10. What is the significance of knowing Energy Costs?
11. What are the effects of load variation on efficiency of induction motors?
12. Define Service Factor in motors.
13. What is the significance of Transformer losses in Energy savings?
14. List any three points for energy savings in Transformers
15. What is called Colour Rendering Index (CRI)?
16. Define Lamp Circuit Efficacy
17. What is the effect of reduction in supply voltage on energy consumption?
18. What is the effect of impeller diameter change in a centrifugal pump?
19. Write three points for energy savings in cables
20. What is the significance of Insulation types in the energy saving in cables

PART– B

21. a. Explain the various factors to be considered in selecting the wire size of conductors/cables used for domestic installations.

OR

- b. State the importance of Insulation Resistance. Explain Insulation Resistance test between earth and conductor and between conductors.
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22.a. A Residential single bed room flat is to be electrified with PVC conduit concealed type of wiring .Estimate the quantity of materials required with specifications. The details of the fittings are as follows:

Room	Size	No. of tube light points	No. of ceiling fans	No. of ordinary light points	No .of Plug points
Hall	5.0m*6.0m	2	1	1	2
Bed Room	4.0m*4.0m	1	1	1	1
Kitchen	4.0m*2.0m	1	-	1	1
Bath Room	1.5m*1.5m	-	-	1	-
Toilet	1.5m*1.5m	-	-	1	-

b. Prepare an Estimate for installing a 5 HP irrigation pump motor.

23. a. Discuss in detail the scope of Energy Audit. **OR**

b. Explain the various factors involved in energy saving in induction motor

24. a. Explain the ways to reduce Transformer Losses.

OR

b. Explain the various parameters to be specified and their significance while ordering for a cable.

25. a. Explain the aspects of Lighting System Designing

OR

b. Explain the various parameters to be considered in evolving an energy efficient pumping system.

**SYLLABUS FOR DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING
M7-SCHEME**

Programme Name : Diploma in Electrical and Electronics Engineering
 Course Code : **M7EE311**
 Term : VI Term
 Course Title : **Power Electronics**

TEACHING AND SCHEME OF EXAMINATION

COURSE & COURSE CODE	INSTRUCTION		EXAMINATION		
	Hours / Week	Hours / Term	Assessment Marks		
Power Electronics M7EE311			Internal Assessment	End exam	Total
	5	80	25	75	100

UNIT	TOPIC	TIME (Hours)
I	Thyristor family, trigger and commutation circuits	14
II	Phase controlled rectifiers	14
III	Choppers and Inverters	14
IV	Control of DC Drives	13
V	Control of AC Drives	13
	Revision/Test	12
	Total	80

RATIONALE:

Developments in Electronics have their own impact in other fields of Engineering. Today all the controls and drives for the electrical machines are formed by electronic components and there are many electronic devices available to handle eclectic power in terms Kilo-Amps and Kilo-Volts. This course gives a comprehensive knowledge base about the devices and circuits used in electrical power control.

OBJECTIVES:

On completion of these units, the student should be able to:

- Explain the characteristics of Thyristor family.
- Draw the SCR trigger circuits.
- Explain the working of trigger circuits.
- Draw the commutation circuits.
- Explain the operation of commutation circuits.
- Explain the principle of advanced trigger circuit using IC TCA 785.
- State the applications of trigger and commutation circuits.
- Explain the operation of microcontroller based trigger circuit.
- Familiarize the phase controlled rectifier.
- Know the applications of the phase controlled rectifier.
- Draw and describe the working of half wave controlled rectifier circuit with R and R L load.
- Draw and explain the working of single phase semi converter bridge and Single phase full Converter Bridge for RL load.
- Draw and explain the operation of single phase and three phase full converter with RL load.
- Familiarizes the dual converter.
- Familiarizes the twelve pulse converter.
- Study the complete protection of converter circuits.
- Understand the working choppers and inverters.
- Know the applications of choppers and inverters.
- Explain the various types of choppers with circuit diagram.
- Describe the various methods of inverters with circuit diagram.
- Understand the control of DC Drives.
- Know the various methods of speed control of DC drives.
- Learn the different types of power factor improvement in phase controlled Converter.
- Study the closed loop control of DC drives.
- Familiarize the control of AC drives.
- Know the torque - speed characteristics of three phase induction motor.
- Study the speed control of three phase induction motor.
- Study the speed control of three phase induction motor using micro computer based PWM.
- Understand the closed loop control of AC drive.
- Know the operation of single phase and three phase cyclo converter.

**ELECTIVE THEORY-II M7EE311 POWER ELECTRONICS
DETAILED SYLLABUS**

Contents : Theory

Unit	Name of the Topic	Hours	Marks
I	<p>Thyristor family, trigger and commutation circuits</p> <p>Thyristor family (Review) SCR rating and their importance - symbol, working characteristics and applications of SCR, DIAC, TRIAC, IGBT, MOSFET, SiC Switch, only symbols of SCS, SUS, SBS, LASCR and GTO. Gate trigger circuits – Requirements – Types of triggering circuits – Pulse transformer in trigger circuits – Rfiring – RC firing – Synchronized UJT firing (Ramp triggering) – IC based advance triggering circuits for SCR & TRIAC (using IC TCA 785) – Microcontroller based Trigger circuits, Block diagram & flow chart. Commutation circuits – SCR turn off methods – Natural commutation – Forced commutation – class A, class B, class C, class D, class E and class F.</p>	14	15
II	<p style="text-align: center;">Unit II – Phase controlled rectifiers</p> <p>Introduction – Application of phase controlled rectifier – Explanation of half wave controlled rectifier with resistive, Inductive loads – Effect of freewheeling diode – single phase semi converter controlled bridge with R load, RL load - single phase fully controlled bridge with RL load – Input power factor – Three phase half controlled bridge with RL load, Three phase fully controlled bridge with RL load – Single phase dual converter – Twelve pulse converter -Extinction angle – Reactive power of converter – Complete protection of thyristors against surge current, surge voltage, dv/dt, di/dt protection in three phase bridge circuit.</p>	14	15
III	<p>Choppers and Inverters</p> <p>Choppers – Introduction – applications – principle of chopper – control strategies – chopper circuit classification – step up chopper – Morgan chopper – Jones chopper – chopper using MOSFET – 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. Inverters – Introduction – Applications – classifications - parallel inverter – Half bridge inverter, Full bridge inverter – Modified MC Murray full bridge inverter, MC Murray Bedford full bridge inverter – Three phase bridge inverter under 180° mode, 120° mode operations – pulse width modulated inverters, (single pulse, multiple pulse, sinusoidal pulse) UPS, online, offline - Control circuit for SMPS.</p>	14	15
IV	<p>Control of DC Drives</p> <p>Introduction – History of DC drive – applications – basic DC motor speed equation – operating region – armature voltage control- field current control – constant torque and constant HP regions – circuit diagram, output waveforms and output equation of – separately excited DC motor in – a) Single phase full converter drives b) Single phase dual converter drives c) Three phase semi converter drives – power factor improvement in phase controlled converter – phase angle control – semi converter operation of fully controlled converter – Asymmetrical firing – chopper fed DC series motor drive – Four quadrant control of DC Motor – DC to DC converter using MOSFET and IGBT – Block diagram, Explanations of closed loop control of DC drives - phase locked loop control of DC drives – Microprocessor based closed loop control of DC drives.</p>	13	15

Unit	Name of the Topic	Hours	Marks
V	Control of AC Drives Introduction – Applications – Torque speed characteristics of three phase induction motor – speed control of Induction Motor – Stator Voltage control – Variable frequency control – necessity of maintaining V/F ratio constant- scalar and vector control of drives (Tacho) – Rotor resistance control- Inverters for variable voltage and variable frequency control – Speed control by rotor resistance for slip ring Induction motors – Static scherbius drive (slip power recovery scheme) - closed loop control of AC drive- block diagram – Micro computer based PWM control of Induction Motor – introduction to cyclo converter with simple circuit.	13	15

TEXT BOOK

Sl. No.	Name of the Book	Author	Publisher
1	Power Electronics	MD Singh KB Khanchandani	McGraw Hill Publishing Company New Delhi seventeenth reprint 2005

REFERENCE BOOKS

Sl. No.	Name of the Book	Author	Publisher
1	Power Electronics – Converter Applications and Design	Mohan Underland Robbins	John Wiley and Sons, New York 2nd Edition
2	Fundamentals of Electrical Drives	G K Dubey	Narosa Publishing House, New Delhi Fourth reprint 2004.
3	Fundamentals of Power Electronics	S Rama Reddy	Narosa Publishing House, New Delhi, First Reprint 2002.
4	Power Electronics	Dr P S Bimbhra	Khanna Publisher- 1991
5	Power Electronics	P C Sen	Tata McGraw Hill Publishing Company New Delhi, 24 th reprimy 2005
6	Power Electronics	Muhammad H.Rashid	Prentice-Hall of India Pvt. Ltd. New Delhi- 110001. 3rd Edition-2005.
7	Power Electronics	M.S. Jamil Asghar	E.E. Edition PHI, 7th print July 2009
8	Power Electronics Devices & Circuits	V. Jagannathan	E.E. Edition 2nd Edition.
9	Power electronics principle and applications	Josep vithayathil	TMH edition.

Power Electronics

Model Question Paper -1

Part A - Answer any fifteen Questions

15x 1 = 15 Marks

1. Draw the symbol of SCR.
2. Define holding current of SCR.
3. Explain dv/dt rating.

4. What is class- B commutation?
5. What are the effects of free wheeling diode?
6. Define input power factor.
7. What is Extinction angle?
8. What do you mean by complete protection of thyristor?
9. Define Chopper.
10. What are the applications of Chopper?
11. How many SCR's are used in parallel inverter?
12. What is the use of UPS?
13. Write the basic DC motor speed equation.
14. What are the advantages of power factor improvement?
15. What is the meaning of Asymmetrical firing?
16. What are the advantages of Microprocessor based DC- drive?
17. What is a Cyclo converter?
18. What are the advantages of AC drive?

19. Draw the circuit of converter fed DC drive circuit

20. Mention the methods of controlling the speed of an AC induction motor

Part B - Answer all the Questions

5 x 12 = 60 Marks

- 21 A) 1. Explain the concept of IGBT
2. Explain synchronized trigger circuit with waveforms.
(Or)
B) 1. With a block diagram explain the IC based advanced triggering circuits for SCR and TRIAC using TCA 785.
2. Explain the concept of Microcontroller based trigger circuit with a block diagram.
22. A) 1. Explain half wave controlled rectifier with resistive load.
2. Draw and explain the complete protection of Thyristor circuit.
(Or)
B) 1. Explain single phase fully controlled bridge with resistive load.
2. Discuss the concept of reactive power of converters.
23. A) 1. Explain MORGAN chopper with suitable circuit and waveforms.
2. Explain completely the modified MC-Murray full bridge inverter.
(Or)
B) 1. Explain CUK converter with circuit diagram.
2. Explain sinusoidal pulse width modulated inverter with suitable circuit.
24. A) 1. Explain three phase semi converter drive with waveforms.
2. Explain DC to DC converter with MOSFET circuits.
(Or)
B) 1. Explain single phase dual converter drives.
2. With block diagram explain Microprocessor based closed loop control of DC drive.
25. A) 1. Explain with circuit diagram the slip power recovery scheme.
2. With the suitable block diagram, explain the operation of closed loop speed control of AC drive.
(Or)
B) 1. Explain with circuit, the work of a single phase to single phase cycloconverter.
2. Explain the various methods of speed control of induction motor using inverters

Power Electronics
Model Question Paper – 2

Part A – Answer any fifteen questions

15x1 = 15 Marks

1. Draw the symbol of MOSFET.
2. Define Latching current.
3. Explain di/dt rating.
4. What is class D commutation?
5. What is firing angle of SCR?
6. Write two applications of phase controlled rectifier.
7. RC snubber is used for what protection?
8. What is overlap angle?
9. What is a step down chopper?
10. What is Time Ratio Control?
11. What are the applications of inverter?
12. What is online UPS?
13. What is armature control of DC Motor?
14. What are the applications of DC drive?
15. What is closed loop control?
16. What are the advantages of Microprocessor based control of DC Motor?
17. In what motor rotor resistance control is used?
18. What is slip power recovery scheme?
19. List any two applications of AC drive
20. Name the methods adopted for improving the power factor in phase controlled converter

Part B – Answer all the questions

5x12 = 60 Marks

- 21a) Explain the working and characteristics of TRIAC.
 - b) Explain the concept of Natural commutation with circuit diagram. (or)
 - c) Explain RC firing with suitable circuit.
 - d) Explain the concept of class B, class D commutations.

 - 22 a) Explain semi converter bridge circuit with RL load.
 - b) Explain the single phase dual converter
(or)
 - c) Explain three phase half controlled bridge converter with RL Load.
 - d) Write a short note on dv/dt, di/dt, short circuit protections.

 - 23 a) Explain Jones chopper with suitable circuit and waveforms.
 - b) Explain sinusoidal pulse width modulated inverter. (or)
 - c) Explain MC-Murray Bedford full bridge inverter circuit.
 - d) Explain Buck Boost DC to DC converter without isolation.

 - 24 a) Explain the principles of armature voltage control and field current control of DC drive.
 - b) With suitable block diagram explain phase locked loop control of DC drives (or)
 - c) Explain separately excited DC Motor speed control with single phase full converter drive.
 - d) Explain with block diagram the closed loop control of DC drives.

 - 25 a) With suitable diagram explain the speed control of three phase Induction Motor using stator voltage control
 - b) Explain Micro computer based PWM control of Induction Motor.
(or)
 - c) Explain the Induction motor speed control circuit in variable frequency variable voltage control method.
 - d) Explain rotor resistance control of AC motor
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**SYLLABUS FOR DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING
M7-SCHEME**

Programme Name : Diploma in Electrical and Electronics Engineering
 Course Code : **M7EE404**
 Term : VI Term
 Course Title : **Embedded Systems-elective II**

TEACHING AND SCHEME OF EXAMINATION

COURSE & COURSE CODE	INSTRUCTION		EXAMINATION		
	Hours / Week	Hours / Term	Assessment Marks		
Embedded Systems-Elective II M7EE404			Internal Assessment	End exam	Total
	5	80	25	75	100

UNIT	TOPIC	TIME (Hours)
I	ARM ARCHITECTURE	14
II	LPC2148 ARCHITECTURE - I	14
III	LPC 2148 ARCHITECTURE - II	14
IV	REAL TIME OPERATING SYSTEM	13
V	µC/OS – II RTOS	13
	Revision/Test	12
	Total	80

RATIONALE:

Increasingly, embedded systems developers and system-on-chip designers select specific microprocessor cores and a family of tools, libraries, and off-the-shelf components to quickly develop embedded system-based products. A major processor in this industry is ARM. Since 1985, the ARM architecture has become the most pervasive 32-bit architecture in the world. ARM processors are embedded in products ranging from cell/mobile phones to automotive braking systems. A worldwide community of ARM partners and third-party vendors has developed among semiconductor and product design companies, including hardware engineers, system designers, and software developers. This course has been to describe the operation of the ARM core from a product developer's perspective with a clear emphasis on its architecture by assuming no previous ARM experience.

OBJECTIVES:

- On successful completion of the course, the students must be able to
- Distinguish between CISC and RISC architecture
- Understand the ARM design philosophy
- Explain the ARM architecture and the pipeline structure
- Describe the little and big endian methods of representation
- Explain the Instruction sets of ARM processor.
- Understand various operational modes in ARM processor
- List the various exceptions
- Develop an assembly level code for basic arithmetic primitive operations
- Relate and distinguish between OS and RTOS in their functionality
- Understand hard time and soft time RTOS
- Explain multitasking, scheduling, ITC, and synchronization
- Understand the functions in µC/OS – II

Unit	Name of the Topic	Hours	Marks
I	ARM ARCHITECTURE	14	15
	Introduction to ARM – ARM Processor Core – Comparison of various ARM families – ARM Extensions: Thumb, Jazzelle, AMBA - Memory Model: Von Neumann and Harvard – ARM Core Dataflow Model – ARM7 Architecture:ARM7TDMI – ARM7TDMI features – Variants in ARM7 – ARM7 functional block diagram – ARM7 internal structure – ARM operating states – ARM Registers: GPR, PC, CPSR,SPSR – ARM7 pipelining Memory and Memory interface – ARM Instruction Set: Data processing instructions, Load and Store instructions, Branch instructions, Coprocessor instructions.		
II	LPC2148 ARCHITECTURE – I	14	15
	ARM based Embedded Microcontroller – LPC 2148 Block Diagram and features – Pin Connect Block – Memory Mapping – Description of PLL and VPB Divider – Description of Vectored Interrupt Controller (VIC) – General Purpose Input/Output Unit: Features, Registers (IODIR,IOPIN,IOSET,IOCLR), Programming software tools – Code Development flow chart: Assembler, Compiler, Linker, Simulator and Programmer.		
III	LPC 2148 ARCHITECTURE – II	14	15
	LPC 2148 Timer: Features, Registers (TCR,CTCR,TC,PR,PC), UART: Features, Registers (UTHR, UDLL and UDLM,ULCR,ULSR), I ² C Features and Operating Modes, SPI Features, SSP Features, USB Features – Analog Interfacing: ADC Features, ADC Registers (ADCR,ADGDR,ADSTAT,ADGSR,ADINTEN,ADDR), DAC Features and DAC Register – RTC and PWM Features.		
IV	REAL TIME OPERATING SYSTEM		

	Definition of RTOS – Comparison with general OS – Soft and Hard RTOS – Task – Multitasking – Context Switching – Task States – Kernel – Non Preemptive Kernel – Preemptive Kernel – Scheduler – Scheduling Algorithm – Task Priority (static and Dynamic) – Mutual Exclusion – Semaphores – Inter Task Communication – Message Mail Boxes – Message Queues.	
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V	μC/OS –II RTOS Introduction – Features of μC/OS –II – Requirements of μC/OS –II - Support Devices for μC/OS – II – File Structure in μC/OS –II – Functions of Task, Memory, Time, Message Queue, Message Mail Box, Mutual Exclusion, Semaphore Management files and Core file – Initializing and Starting of μC/OS –II - Creating a Task – Deleting a Task – Implementation of Scheduling in μC/OS –II.		
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REFERENCE BOOKS:

1. Embedded Systems Architecture – Tammy Noergaard
2. ARM System Developer’s Guide – Andrew N.Sloss
3. ARM Architecture Reference Manual – David Seal
4. ARM System-on-Chip Architecture (2nd Edition) by Steve Furber
5. μC/OS – II The Real Time Kernel Jean J. Labrosse
6. Real Time Concepts for Embedded Systems – by Qing Li and Caroline Yao
7. Embedded / Real Time Systems : Concepts, Design and Programming by
Dr.K.V.K.K.Prasad
8. LPC 2148 User Manual

Embedded Systems

Model question paper – I

Time : 3 Hrs.

Max. Marks: 75

Note: Part A questions carry each 1 mark and answer any Fifteen questions.

Part B questions carry each 12 marks and answer all questions by selecting either “a” or “b”.

PART- A 15 x 1 = 15 Marks

1. Distinguish between RISC and CISC
2. Expand AMBA
3. How many switching state are there in ARM? Mention them.
4. What is the operating core processor of LPC2148 Microprocessor?
5. What is PCB?
6. How many general – purpose I/O pins are available in LPC2148. Mention the pin names.
7. What is the use of PLL?
8. What is a compiler?
9. How many timers are in LPC2148?
10. Mention the purpose of UTHR register?
11. Mention the various serial communication facilities available in LPC2148.
12. What is RTC? Mention its purpose.
13. What are the types of RTOS?
14. Define Kernel.
15. What is the function of a scheduler?
16. What is Semaphore?
17. Mention any two features of μ C/OS – II.
18. Write the function for creating task in μ C/OS – II.
19. Mention any two support devices for μ C/OS – II.
20. How many user tasks can be handled by μ C/OS – II?

PART- B 5 x 12 = 60 Marks

Note: i) Answer all the questions choosing either ‘A’ or ‘B’ from each question.

ii) All Questions carry equal Marks.

21A) Explain with neat diagram, explain the function of each block in ARM7 TDMI [12]
(OR)

B) Explain about various load and store instructions in ARM [12]

22 A) Explain LPC2148 block diagram [12]

(OR)

B) i) Discuss about PLL in LPC2148 [6]

ii) Discuss about Memory mapping in LPC2148 [6]

23 A) Explain about the important registers associated with the timer function [12]

(OR)

B) Explain about UART operation in detail [12]

24 A) Explain any two types of scheduling algorithm in detail [12]

(OR)

B) i) Explain about message Mail box [12]

ii) Explain about message queues.

25 A) Explain any four memory management functions in $\mu\text{C}/\text{OS} - \text{II}$? [12]

(OR)

B) Create two different tasks for addition and multiplication in $\mu\text{C}/\text{OS} - \text{II}$? [12]

Embedded Systems

Model question paper – II

Time : 3 Hrs.

Max. Marks: 75

Note: Part A questions carry each 1 mark and answer any Fifteen questions.

Part B questions carry each 12 marks and answer all questions by selecting either “a” or “b”.

PART- A

15 x 1 = 15 Marks

1. Expand TDMI.
2. How many ARM registers are available for user in ARM. Mention their names
3. How many exceptions are there in ARM?
4. What is the advantage of THUMB state?
5. What is the ON-CHIP RAM size in LPC2148?
6. What is the function of IODIR register?
7. What is the need for VPB divider?
8. How many interrupts can be categorized under vectored interrupts?
9. How many ADC channels are available in LPC2148 and mention their names.
10. Mention any two USB features.
11. How many registers are involved in DAC operation?
12. What is PWM? What is its use?
13. What is RTOS?
14. How many tasks states are there?
15. Define context switching.
16. What is multitasking?
17. Mention the kernel type used by μ C/OS – II?
18. Write a function to delete a task in μ C/OS – II?
19. Mention the name of subroutine used to start μ C/OS – II. In which file it is available.
20. Give any two features of μ C/OS – II

PART- B

5 x 12 = 60 Marks

Note: i) Answer all the questions choosing either ‘A’ or ‘B’ from each question.

ii) All Questions carry equal Marks.

21 A) Draw ARM core data flow model and explain

[12]

(OR)

B) i) Explain Von – Neumann and Harvard architecture

[6]

- ii) Explain Pipe lining in ARM 7 [6]
- 22 A) i) Explain the function of VIC with block diagram [12]
(OR)
- B) i) Explain GPIO. [8]
ii) Explain VPB divider [4]
- 23 A) i) Explain the I²C operating modes in detail [12]
(OR)
- B) i) Explain the PWM operation in LPC 2148 [12]
- 24 A) i) What is kernel? Explain its types [12]
(OR)
- B) i) Explain the semaphore operation [6]
ii) Explain task with task state diagram [6]
- 25 A) i) Explain the file structure of μ C/OS – II [12]
(OR)
- B) i) Explain how scheduling is implemented in μ C/OS – II [12]

M7EE405 - “C” PROGRAMMING AND OOPS (ELECTIVE THEORY II)

Total No. of Hrs. / Week **5**
Total No. of Weeks / Term **: 16**
Total No. of Hrs. / Term **: 80**

Scheme of Instruction and Examination

Course & Course code	Instruction		Examination		
	Hours / Week	Hours / Term	Assessment marks		
			Internal Assessment	end exam	Total
C PROGRAMMING AND OOPS M7EE405	5	80	25	75	100

Topics and allocation

UNIT	TOPIC	TIME (Hours)
I	Keywords, Constants, Variables and Data types	14
II	Decision Making, Branching and Looping and Arrays	14
III	Character String and Functions	14
IV	Pointers and File Management	13
V	Object oriented programming	13
	Revision, Test	12
	Total	80

DETAILED SYLLABUS

Unit	Name of the Topic	Hours	Marks
I	<p>Keywords, Constants, Variables and Data types</p> <p>Character Set – Constants – Integer Constants – Character Constants – String Constants; Variables – Declaration of Variables; Assigning value to Variables.</p> <p>Operations and Expressions: Arithmetic, Relational, Logical, Assignment, Increment, Decrement, Conditional, Bitwise Operator, Arithmetic Expressions, Evaluation of Expression.</p> <p>I/O Statements: Printf() and Scanf() functions (Unformat and formatted), getchar() and putchar() functions.</p> <p>Functions: Predefined functions – isdigit, isupper, islower and ispunct functions in header file <ctype.h> ; cos, tan, exp, ceil, floor, abs, pow and sqrt functions in header file <math.h>; Strlen, strcpy, strcmp and strcat in header file <string.h>.</p>	14	15
II	<p>Decision making, Branching and Looping and Arrays</p> <p>Introduction: Simple if statement.</p> <p>Decision Making and Branching: The if...else statement; Nesting of if...else statement; else...if ladder; switch case statement; goto statement.</p> <p>Looping: While statement; do...while statement; for statement, break and continue statement.</p> <p>Arrays: One Dimensional Arrays; Two Dimensional Arrays – Initializing One dimensional and Two-Dimensional Arrays; Multidimensional Arrays.</p>	14	15
III	Character String and Functions		

	<p>Character Strings: Introduction – declaring and initializing string variables; Reading Strings; Writing Strings; Comparison of two Strings; String handling functions; User defined functions.</p> <p>Functions: Function – declaration, function – definition, function call, passing arguments, returning values, return statement.</p> <p>Structures and Unions: Structure definition; Structure Initialization; Arrays of Structures; Structures within structures; Unions.</p>		
IV	<p>Pointers and File Management Macro Substitution; File Inclusion; Compiler Controlled Directives.</p> <p>Pointers: Understanding Pointers: Accessing the address of Variables; Declaring and Initializing Pointers; Accessing a variable through its pointer; Pointer Expressions; Pointer Increments; Pointers and Arrays; Pointer and character Strings; Pointer and functions; Pointers and Structures.</p>		

V	<p>Object oriented programming Introduction to OOPS: Limitation of Procedural Languages; Object Oriented approach – Analogy; Approach to Organization, characteristics of Object Oriented Languages – Objects, Classes, Inheritance, Reusability, Structure of C++ Programs, Creating New Data types, Polymorphism, Inheritance and Overloading (Simple Programs) – Application of OOPs.</p>		
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Reference Books :

Sl.No.	Name of the Book	Author	Publisher
1	Programming in 'C' (with CD)	Balagurusamy E	Tata McGraw Hill Publishing Company, New Delhi.
2	Object Oriented Programming with C++	Balagurusamy E	Tata McGraw Hill Publishing Company, New Delhi.
3	Computer Programming in C	Rajaraman V	Prentice Hall of India (P) Ltd., New Delhi

C programming and OOPS (Elective Theory II)
Model question I

Time : 3 Hrs.

Max. Marks: 75

Note: Part A questions carry each 1 mark and answer any Fifteen questions.

Part B questions carry each 12 marks and answer all questions by selecting either “a” or “b”.

Part-A (Answer any 15 questions)

1. Define “identifier”.
2. What is Header file?
3. What are the types of looping statements?
4. Differentiate do-while and while statements?
5. What is String?
6. Compare structure and Union?
7. What is macro substitution?
8. Compare get c and put c function
9. Define inheritance
10. Define object
11. What is bitwise operator?
12. What is predefined function?
13. What is subscript?
14. Compare 1-Dimensional array and 2-Dimensional array
15. What is union?
16. State the use of return statement
17. What is pointer?
18. What is compiler controlled directive?
19. Define class
20. Define polymorphism

PART B

- 16(a). Explain the use of printf() and scanf() functions(12)
(OR)
(b). Write a ‘C’ program to solve quadratic equation(12)
- 17(a). Describe about ‘while’ and ‘do-while’ with examples(12)
(OR)
(b). Explain 1-Dimensional and 2-Dimensional array(12)
- 18(a). Describe about passing arguments to a function(12)
(OR)
(b). Explain about ‘Structure within a structure’(12)
- 19(a). Write a program using swap() function, to interchange the values. (12)
(OR)
(b). Explain how an array of storage is handled using a pointer(12)
- 20(a) Describe the characteristics of OOPS. (12)
(OR)
(b) Explain Input/ Output operations on Files(12)

“C” PROGRAMMING AND OOPS(Elective theory-II)

MODEL QUESTION-II

Time : 3 Hrs.

Max. Marks: 75

Note: Part A questions carry each 1 mark and answer any Fifteen questions.

Part B questions carry each 12 marks and answer all questions by selecting either “a” or “b”.

Part-A (Answer any 15 questions)

1. Give examples of logical operators
2. What is the use of strlen ()function
3. Give the use of getchar () function
4. What is string constant?
5. Write the syntax of simple ‘if’ statement
6. What is the use of ‘break’ statement?
7. How will you initialize 1-dimensional array
8. Give an example of ‘goto’ statement
9. What are string handling function
10. Give the syntax of ‘return’ statement
11. What is function call?
12. Define ‘structure’
13. What is ‘macro’?
14. Give example for #define
15. How will you access a variable, through its pointer?
16. What are command line arguments?
17. What is the limitation of procedure oriented languages?
18. What is object?
19. Give the application of oops
20. What is ‘inheritance’

Part- B

- 16.(a)Explain the usage of functions in <math.h> and <ctype.h> Header files(12)
(or)
(b)Describe about printf() and scanf() functions(12)
- 17.(a)Explain ‘for’ and ‘switch’ statements(12)
(or)
(b)Write a program to count the number of characters in a string(12)
- 18.(a)Write a program to find factorial of a number , using function(12)
(or)
(b)Describe union with an example(12)
- 19.(a)Explain about compiler controlled directives(12)
(or)
(b)Describe about pointer in function(12)
- 20.(a)Explain, how a file can be opened and closed in ‘c’(12)
(or)
(b)Explain the characteristics of oops(12)

**SYLLABUS FOR DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING
M7-SCHEME**

Programme Name : Diploma in Electrical and Electronics Engineering
Course Code : **M7EE316**

Term : VI Term
Course Title : **WIRING & WINDING PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per Term: 16

Course and course code	Instruction		Examination Assessment		
	Hours / Week	Hours / Term	Internal Assessment	End Examination	Total
Wiring and Winding Practical : M7EE316	6	96	25	75	100

RATIONALE

To provide hands on experience in Electrical wiring and winding it becomes necessary to include this course.

OBJECTIVES

At the end of this practical course the students should be able to

- Execute the wiring to control three lamps Individually
 - Execute the stair case wiring for G+n floors
 - Execute the emergency alarm circuit
 - Execute the wiring to connect a single phase motor with main switch, D.O.L starter and M.C.B
 - Execute the wiring to connect a 3 phase Induction motor with main switch, star/delta starter and E.L.C.B.
 - Execute the wiring for 1 phase service connection with necessary items.
 - Execute the wiring to control lamps (Sodium vapour lamp, mercury vapour lamp, Fluorescent Tube and Neon sign lamp) with a provision of fuse/ M.C.B/Electronic chock / switches
 - Execute the wiring for test end with necessary items.
 - Know the consequences of disconnection of Neutral in 3 phase 4 wire system. x Execute the Tunnel wiring
 - Prepare winding for potential Transformer and No volt coil with the knowledge of Design. x Give end connections for 3 phase Induction motor winding.
-

M7EE316 WIRING & WINDING PRACTICAL

Contents: Practical

List of Experiments

WIRING

1. Control three lamps individually providing MCB to protect the circuit.
2. Execute the stair case wiring for G+3 floors.
3. Execute the Emergency alarm circuit with a provision of 3 bells in series to ring together when any one of the 3 push button is pressed.
4. Execute the wiring using single phase main switch, Single phase D.O.L starter and miniature C.B to install single phase Induction motor.
5. Execute the wiring using Three phase main switch, Star/delta starter and Earth Leakage C.B to install 3phase Induction motor with a provision for arrangement to trip ELCB when fault occurs.
6. Execute the wiring for service connection with single phase Energy meter cutout, main switch, 4way D.B, Indicator lamp and connect a load on any one sub circuit.
7. Execute the wiring for connecting sodium vapour and mercury vapour Lamp with single phase supply.
8. Execute the Fluorescent Tube light connection with Electronic choke and test it. Also measure the voltage across the tube light fitting.
9. Construct a simple model (with minimum 3 Blocks)to know the usage of Neon tube circuit in advertisement.
10. Prepare a test board with necessary supply provision, Indicator lamp, fuse unit to test electrical appliances.
11. In a 3 phase, 4 wire system, connect two lamps in different ratings between R-Phase to Neutral and y-phase to Neutral respectively. Disconnect the Neutral using SPST switch. Note the changes occur in two lamps.
12. Execute the Tunnel wiring at least for four lamps fixed at equal intervals successively.

WINDING

13. Design and wind 230/12-0-12 volt, 500mA Transformer and test it.
14. Design and wind a No volt coil used in starter.
15. Wind and insert the coils for ceiling fan motor (minimum 2 coils)
16. Give end connection for a 3 phase Induction motor winding for a 2 pole/ 4 pole operations and run it. Measure the No load current and speed.

Equipment / Materials required

Sl. No.	Description	Specification	Qty
1	SPST Flush type switch	250 V, 5A	15 Nos.
2.	Batten Lamp holder		10 Nos.
3.	Round block		20 Nos.
4.	Switch board	20 cm x 15 cm	1 No.
		10cmx10cm	15Nos.
5.	M.C.B.	250V, 10 A,2 pole	2Nos.
6.	Push button switch	250 V, 5A	5 Nos.
7.	2 plate ceiling rose	250 V, 5A	10 Nos.
8.	Electric bell	250 V, 5A	3 Nos.
9.	Single phase D.P.I.C. Main switch	250 V, 16A	3 Nos.
10.	Single phase D.O.L. Starter	250 V, 10 A	1 No.
11.	Three phase T.P.I.C. Main switch	500 V, 30 A	2 Nos.
12.	Star/ delta starter	440 V, 5 H.P.	1 No.
13.	E.L.C.B.	500 V, 30 A	1 No.
14.	Single phase, 2 wire watt-hour meter	250 V, 15A, 50 hz	1 No.
15.	Cutout	16A	1 No.
16.	Single phase, 4 way distribution Box	250 V, 15 A	1 No.
17.	Mercury vapour lamp with accessories		1 set
18.	Sodium vapour lamp with accessories		1 set
19.	Fluorescent tube light with electronic choke and holder	40 W	1 set
20.	Neon tube lamp (any sign)		3 blocks
21.	Two way flush type switch	250 V, 5A	10 Nos.
22.	Wooden box	30 cm x 15 cm	1 No.
23.	PVC pipe	1"	Required qty
24.	Saddle clips	1"	Required qty
25.	Copper wire	2.5 sq.mm. 1.5 sq.mm.	Required qty
26.	1" junction box	One way Two way Three way	Required qty
27.	Screws		Required qty

28.	Bare copper wire	2.5 sq. mm	Required qty
29.	Lamps (C.F.L. or Incandescent)	Different ratings	Required qty
30.		Transformer	
	EI60 type stampings of 0.35 mm thickness		55 Nos.
31	Readymade bobbins (EI60/21)		Required qty
32.	Winding coil (copper)	25 SWG 36 SWG 37 SWG 38 SWG	Required qty
33	Varnish		Required qty
34.	Winding machine		1 No.
35.	Ceiling fan (motor)		1 No.
36.	Single phase induction motor	0.5 H.P. 50 Hz, 240 V	1 No.
37.	Three phase squirrel cage induction motor	3 H.P., 500 V, 50 Hz	2 Nos.

Allocation of marks

- | | |
|---------------------------|------------|
| 1. Wiring diagram /Design | - 20 marks |
| 2. Execution | - 40 marks |
| 3. Result | - 10 marks |
| 4. Viva-voce | - 05 marks |
| Total marks | - 75 marks |

**SYLLABUS FOR DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING
M7-SCHEME**

Programme Name : Diploma in Electrical and Electronics Engineering
Course Code : **M7EE409**
Term : V Term
Course Title : **ELECTRICAL CIRCUITS SIMULATION PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per Term: 16

Course and course code	Instruction		Examination		Total
	Hours / Week	Hours / Term	Internal Assessment	End Examination	
Electrical Circuits Simulation Practical M7EE409	5	80	25	75	100

RATIONALE

All the Engineering applications are simulated through computers. They are tested and then built using real components for commercial implementation. Simulation softwares are available for all Engineering fields. Hers is an attempt to impart the knowledge of using simulation software for realizing some of the Electrical and Electronics circuits for the Diploma students.

OBJECTIVES

On completion of this practical subject, the students will be able to

- Know the various aspects of a simulation software
- Simulate and test the simple electrical and electronics circuits
- Simulate and test the wave generating circuits
- Simulate and prove the simple theorems
- Simulate and test the performance characteristics of converters
- To design and verify the results of various electric circuits using simulation software (MATLAB) and orcad.

M7EE409 ELECTRICAL CIRCUITS SIMULATION PRACTICAL

DETAILED SYLLABUS

Contents: Practical

ORCAD SIMULATION

1. Half wave Rectifier with R & RL Load & study all the waveforms.
2. Half wave controlled Rectifier (SCR) with RL Load & study all the waveforms.
3. Three phase Diode bridge Rectifier & study all the waveforms.
4. Buck DC-DC Converter.
5. Buck Boost DC-DC Converter.
6. Sine PWM Generation.
7. MOSFET Based Push-Pull Inverter.
8. Design a PID controller & study the waveform for step response.
9. Simple power factor correction in full wave rectifier.

SIMULINK - MATLAB SIMULATION

1. Develop a closed loop control system.
2. Develop a model for V/F control of IM.
3. 4 Quadrant chopper for DC motor Drive.
4. 3 phase, 6 pulse VSI with Resistive & Inductive Loads - study all voltage & current output waveforms
 $V_{a,b,c}, I_{a,b,c}, V_{ab, bc, ca}$
5. BLDC motor speed control.
6. 220 Volt DC Source using Thyristor.
7. SCR Based Battery Charger.
8. MOSFET based charge controller for Solar Panel.
9. To develop 12 pulse converter and study all Output waveforms and find its first 10 Harmonics

SIMULINK – PSPICE INTERFACE BASED EXPERIMENTS

1. Create a MOSFET based Driver for stepper motor in ORCAD and use it in the Simulink Block to control the stepper motor.
2. Design 2 types of firing circuit for Thyristor and use it in EXP 6.

Scheme of Evaluation

Sl. No.	Activity of the Candidate	Maximum Marks
1	Circuit Diagram (Manual Drawing)	20
2	Development & Simulation	35
3	Print out	10
4	Viva	10
	Total Marks (External)	75

Programme Name : Diploma in Electrical and Electronics Engineering
 Course Code : M7EE317
 Term : VI Term
 Course Title : **POWER ELECTRONICS PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per Term: 16

Course and course code	Instruction		Examination Assessment		
	Hours / Week	Hours / Term	Internal Assessment	End Examination	Total
POWER ELECTRONICS PRACTICAL M7EE317	5	80	25	75	100

RATIONALE

AC to DC conversion, DC to AC inversion, Voltage and Current controls, Voltage to Frequency conversion with high voltage supplies became possible with the introduction of Power Electronic Devices. Without these operations the electric drives are useless in these days. This course is introduced to impart practical skills to the students in using some important power electronic devices and circuits.

OBJECTIVES

On completion of the following experiments, the students must be able to

- To draw the characteristics of SCR
 - Get the knowledge about the trigger circuit
 - Draw the input/output waveform using semi converter controlled bridge and FCB
 - Know the performance of lamp control using DIAC-TRIAC
 - Learn the various techniques used for turn-off of Thyristor
 - Learn the half wave controlled rectifier with R- Load
 - Draw the waveform of parallel inverter
 - Draw the output waveform of DC chopper
 - Learn the concept of single phase to single phase cyclo converter
 - Measure the output voltage of step up chopper.
 - Find the performance of speed control of universal motor
 - Understand the concept of closed loop control of AC motor (microprocessor controlled PWM)
 - Know the performance of speed control of DC motor by varying firing angle
 - Understand the concept of closed loop control of DC motor using microprocessor
 - Draw the output waveform of DC chopper using MOSFET/IGBT
-

M7EE317 POWER ELECTRONICS PRACTICAL

List of Experiments

1. Characteristics of SCR and marking important parameters.
 2. Line synchronized Ramp trigger circuit using UJT with AC load.
 3. Lamp control circuit using DIAC – TRIAC.
 4. SCR commutation circuits (Class B & Class D)
 5. Single phase semi controlled bridge with R- Load
 6. Single phase fully controlled bridge with RL- Load
 7. Half wave controlled rectifier with R- Load.
 8. DC chopper control circuit using thyristor (any one).
 9. Construct and test the step up chopper.
 10. PWM based step down DC chopper using MOSFET/IGBT.
 11. Single phase Single pulse / Sinusoidal PWM inverter using MOSFET/IGBT.
 12. SMPS using MOSFET/IGBT.
 13. DC shunt motor speed control circuit (open loop)
 14. Open loop speed control of single phase AC motor
 15. Universal motor control circuit using TRIAC.
 16. Open loop speed control of Single phase AC motor.
 17. Single phase parallel inverter using MOSFET/IGBT
 18. Single phase to single phase cyclo converter.
-

Scheme of Evaluation

Sl No.	Activity of the Candidate	Maximum Marks to be awarded
1	Drawing Correct Diagram and writing Details of the Components/Equipments/Machines used	15
2	Making the correct circuit connections	15
3	Conducting the Experiment <ul style="list-style-type: none">- Following the correct procedure- Taking the appropriate readings- Following the appropriate safety procedure	25
4	Tabulation of Readings Interpretation of Results Graphical Representation (if required)	15
5	Viva-voce (Questions related to the given experiments only)	5
	Total Marks (External)	75

**SYLLABUS FOR DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING
M7-SCHEME
M7EE410 EMBEDDED SYSTEM PRACTICAL ELECTIVE-II**

Total No. of Hours / Week : 5
Total No. of Weeks / Term : 16
Total No. of Hours / Term : 80

Scheme of Instruction and Examination

Course & Course code	Instruction		Examination		
	Hours / Week	Hours / Term	Assessment Marks		
Embedded Systems Practical Elective-II M7EE410			Internal Assessment	End examination.	Total
	5	80	25	75	100

ALLOCATION OF MARKS	
PROGRAM WRITING	35 MARKS
DEBUGGING AND EXECUTION	30 MARKS
RESULT	5 MARKS
VIVA – VOICE	5 MARKS
TOTAL	75 MARKS

LIST OF EXPERIMENTS

1. Write Simple Assembly Programs for
 - a. Addition
 - b. Subtraction
 - b. Multiplication
 - d. Division
2. Write Programs for
 - a. Bit Digital Output -LED Interface
 - b. 8 Bit Digital Inputs (Switch Interface)
3. Write Programs for
 - a. 4 × 4 Matrix Keypad Interface
 - b. Buzzer Interface
 - c. Relay Interface
4. Write a Program for character based LCD Interface
5. Write a Program for Analog to Digital Conversion(On chip ADC)
6. Write Programs for I2C Device Interface:
 - a. Serial EEPROM
 - b. Seven Segment LED Display Interface
 - c. Real Time Clock
7. Interfacing With Temperature Sensor
8. Stepper Motor Interface

Hands on Exercise Based on RTOS.

9. To Study and Implement Multitasking .Write a Simple Program with Two Separate LED Blinking Tasks.
10. Study and Implement Priority Scheduling and OS Time Delay Functions by writing 3

- different UART Transmitting Tasks.
11. Implement OS Real Time Multitasking by writing a multitasking program with the tasks.
 - a. Interface RTC and Display on LCD First Line Continuously.
 - b. Interface ADC and Display on LCD Second Line Continuously.
 12. Implement OS Real Time Multitasking by implementing three tasks
 - a. Read the Key input and display on seven segment LED
 - b. Read the ADC Analog input and Plot the Corresponding signal on a graphical LCD.
 - c. Generate a PWM signal with Xon Time and Yoff Time.
 13. Interface a Stepper motor and Control the speed of rotation by implementing RTOS delay function.

**M7EE411 - 'C' PROGRAMMING AND OOPs PRACTICAL
(ELECTIVE PRACTICAL II)**

Total No. of Hours / Week : 5
Total No. of Weeks / Term : 16
Total No. of Hours / Term : 80

Scheme of Instruction and Examination

Course & Course code	Instruction		Examination		
	Hours / Week	Hours / Term	Assessment Marks		
			Internal Assessment	End examination	Total
'C' PROGRAMMING AND OOPs PRACTICAL M7EE411	5	80	25	75	100

LIST OF EXERCISES :

1. Program to calculate simple and compound interest.
2. Solution of a Quadratic Equation.
3. Program for Pay bill calculation.
4. Program to compute sum of series using While loop.
5. Printing of multiplication table using Do...While loop.
6. Program to find whether the given number is a positive number, negative number or zero.
7. Program to sort a list of numbers
8. Program to sort the strings.
9. Preparation of the rank list of a class of students.

10. Program to implement Matrix addition and multiplication.
11. Program to implement Fibonacci series.
12. Program to find factorial of given N numbers with out recursion.
13. Program to find factorial of given N numbers with recursion.
14. Program to tabulate a survey data.
15. Program to count number of characters, words and lines in a text.
16. Program to develop a pattern (eg.: pyramid, square)
17. Write a function to swap the values of two variables to illustrate the concept of pass by reference.
18. Write a program to add five numbers by getting the values through command line argument.

M7EE413 PROJECT WORK AND ENTREPRENEURSHIP

Total No. of Hours / Week : 3
Total No. of Weeks / Term : 16
Total No. of Hours / Term : 48

Scheme of Instruction and Examination

Course & Course code	Instruction		Examination		
	Hours/ Week	Hours/ Term	Assessment Marks		
			Internal Assessment	End exam	Total
PROJECT WORK M7EE413	3	48	25	75	100

EVALUATION FOR END EXAMINATION:

Details of Mark allocation	Max Marks
Marks for Demo, Viva-voce	45

MARK ALLOCATION	
PROGRAM	30
EXECUTION	30
RESULT	10
VIVA-VOCE	5
TOTAL	75

Marks for answers of 15 questions which is to be set by the external examiner from the given question bank consisting of questions in the following three topics Entrepreneurship, Disaster Management and Environmental Management. Out of fifteen questions five questions to appear from each of the above topics i.e. 5 questions x 3 topics = 15 questions 15 questions x 2marks = 30 Marks	30
Total	75

DETAILED SYLLABUS

ENTREPRENEURSHIP, ENVIRONMENTAL & DISASTER MANAGEMENT

1. ENTREPRENEURSHIP

1.1 Introduction – Entrepreneur – types -Characteristics & attributes of Entrepreneur – Expectations of entrepreneurship – Contributions of an entrepreneur - Identifying problems and opportunities. - Why do Entrepreneurs fail

1.2 Types of Industries - Importance of SSI – Assistance offered – Governmental and Non-Governmental organizations – Identifying prospects of various Small scale industries in your area with resources and other infrastructural facilities available.

1.3 Starting a SSI – various stages – product – ownership – locality – points related to building, water and electricity – financial assistance – raw materials – machineries – human resource – efficient manufacturing techniques – marketing - Technical, Financial, Marketing, Personnel and Management Feasibility study and report - concessions and incentives offered by agencies.

1.4 Industrial Zones – industrial Estates - Pollution Control – industries with pollution problem - Marketing assistance

1.5 Acquiring common services – repairing – testing facilities – training institutions – suppliers of applied technology.

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. What is entrepreneurship? Explain.
2. Who is a successful entrepreneur? Why?
3. List the various stages of decisions an entrepreneur has to make before reaching the goal of his project.
4. List the types of industries.
5. Define - Small scale industry.
6. What are the qualities of an entrepreneur?
7. What are the expectations of entrepreneurship?
8. What are the various SSI that can flourish in your district?
9. Identify the infrastructural needs for an industry.
10. Identify the natural resources available in your area for starting a SSI.
11. What are the various agencies involved in the establishment and development of various SSI?
12. What are the roles of District Industries Centre?
13. Name some of the agencies funding SSI.
14. What are the various concessions and incentives available for a SSI?
15. List the points to be considered with relation to building, water and electricity before a SSI is started.
16. List the points to be considered with relation to human resource before a SSI is started.
17. Name some consumer products with wide demand that can be manufactured by a SSI?
18. Identify the non-qualified industries that may not be given financial assistance and concessions.
19. What is feasibility study?
20. What is the importance of SSI?
21. List some industries identified as pollution-free industries.
22. List some industries identified as industries with pollution problem.
23. What is an industrial zone?
24. What is an industrial estate?
25. What are the facilities available in an industrial estate?
26. Identify the various training agencies associated with SSI.
27. What is applied technology?
28. From whom you shall get applied technology for starting a SSI?
29. From where you shall get repairing and testing facilities?
30. What are the various training agencies available for acquiring SSI training?
31. List the governmental agencies from whom you shall get financial assistance for a SSI.
32. What are the steps involved in preparing a feasibility report.
33. What are the factors to be considered regarding raw materials for a SSI?
34. Name some SSI that may not need raw materials.
35. Differentiate various classifications of industries.
36. What is a LSI?
37. What are the features of a SSI?
38. Name some products that may not need electricity for production.
39. What are the factors to be considered for starting a SSI?
40. What are the advantages of becoming an entrepreneur?
41. If you opt to be an entrepreneur what are the steps you would take to become a successful entrepreneur.
42. What are the facilities available for a new SSI in an industrial estate?
43. List the various government departments that would be associated with a SSI.
44. Why do entrepreneurs fail?
45. What are the types of entrepreneurs?

2. ENVIRONMENTAL MANAGEMENT:

1. What is the responsibility of an Engineer-in-charge 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? What are all the different organizations you know, which deals with pollution control?
5. List out the different types of pollutions caused by a Chemical / Textile / Leather / 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 their 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 of daily cover.
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? State few reasons for its destruction.
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 lie: (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?

Exam schemes

The Project may be reviewed twice during 4th and 10th week of VI Term.

a) Internal assessment mark for Project Work:

Project Review I & II (VI Term) (5+5)	:	10 marks
Project Report	:	10 marks
Attendance	:	5 marks

TOTAL	:	25 marks

b) Mark Allocation for Project Work in End Examination

Viva Voce	:	25 marks
Demonstration / Presentation	:	20 marks

TOTAL	:	45 marks

c) Written Test Mark (from 3 topics for 1 hour duration):

a) Entrepreneurship	5 questions X 2 marks	:	10 marks
b) Environment Management	5 questions X 2 marks	:	10 marks
c) Disaster Management	5 questions X 2 marks	:	10 marks

TOTAL		:	30 marks

Total (b + c)	=		75 marks

A neatly prepared **PROJECT REPORT** as per the format has to be submitted by individual student during the Project Work End Examination.