

**DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING
V- SEMESTER**

TEACHING AND EXAMINATION SCHEME

Sl. No.	Course Code	Course Name	Teaching Scheme					Examination Scheme						
			Instruction periods per week			Total Periods per semester	Credits	Continuous internal evaluation			Semester end examination			
			L	T	P			Mid sem. I	Mid sem. II	Internal evaluation	Max. Marks	Min. Marks	Total marks	Min. marks for passing including internal
1	18EE-501F	Industrial Management and Entrepreneurship	3	1	0	60	3	20	20	20	40	14	100	35
2	18EE-502C	AC Motors	3	1	0	60	3	20	20	20	40	14	100	35
3	18EE-503E	Program Elective – I	3	1	0	60	3	20	20	20	40	14	100	35
4	18EE-504E	Program Elective- II	3	1	0	60	3	20	20	20	40	14	100	35
5	18EE-505C	Electrical Estimation and Utilization	3	1	0	60	3	20	20	20	40	14	100	35
6	18EE-506P	AC Motors Lab Practice	1	0	2	45	1.5	20	20	20	40	14	100	35
7	18EE-507P	Power Electronics Lab Practice	1	0	2	45	1.5	20	20	20	40	20	100	50
8	18EE-508P	Programmable Logic Controllers Lab Practice	1	0	2	45	1.5	20	20	20	40	20	100	50
9	18EE-509P	Programming in C Lab Practice	1	0	2	45	1.5	20	20	20	40	20	100	50
10	18EE-510P	Project work	1	0	2	45	1.5	20	20	20	40	20	100	50
11	Skill up gradation		0	0	7	105	2.5	0	0	Rubrics				
Total			20	5	17	630	25	200	200	200	400	170	1000	425
Activities: student performance is to be assessed through Rubrics														
Program Elective – I														
	18EE-503E (A)		Industrial Electronics											
	18EE-503E (B)		Power Electronics											

Program Elective – II		
	18EE-504E (A)	Switchgear and Protection
	18EE-504E (B)	Advanced Protection of Power Systems

INDUSTRIAL MANAGEMENT AND ENTREPRENEURSHIP

Course Title	: Industrial Management and Entrepreneurship	Course Code	: 18EE-501F
Semester	: V	Course Group	: Foundation
Teaching Scheme in Periods (L:T:P)	: 45:15:0	Credits	: 3
Methodology	: Lecture + Tutorial	Total Contact Periods	: 60 Periods
CIE (Continuous Internal Evaluation)	: 60 Marks	SEE (Semester End Examination)	: 40 Marks

This course is common for DCME, DECE , DEIE & DFWT

Prerequisites

This course requires the basic knowledge of management and entrepreneurship skills.

Course Outcomes

CO1	To become aware of business and management concepts.
CO2	Analyze the various rules and regulations required for the planning of factory and its staff.
CO3	Analyze balance sheet and various budget issues.
CO4	Analyze the material required and its management economically.
CO5	Analyze the quality management and know the analysis procedure for quality.
CO6	Able to establish a small scale industry by knowing the entrepreneurship skills.

Blue Print of Marks for SEE

Unit No	Unit Name	Periods	Questions to be set for SEE				
			R		U	A	
1	Overview of Business, Management Process and Organization Management	8	Q4	Q1	Q9(a)	Q13(a)	
2	Human resource Management	10					
3	Finance Management	10		Q2	Q10(a)	Q14(a)	
4	Material Management	10					
5	Project Management	10		Q3	Q5,Q6	Q9(b), Q11(a), Q11(b)	Q13(b), Q15(a), Q15(b)
6	Entrepreneurship and Supporting Institutions	12			Q7,Q8	Q10(b), Q12(a), Q12(b)	Q14(b), Q16(a), Q16(b)
Total		60	8		8	8	

Course Content

Upon completion of the course the student should be able to

UNIT 1 - Overview of Business, Management Process and Organization Management

Duration 8 (L:6 T:2)

Business - types of business in various sectors- service, manufacturing & trade- Industrial sectors – Engineering, process, Textile, Chemical, Agro industries – Globalization and effect of globalization – advantages and Disadvantages- Intellectual Property Rights (I.P.R.)- Concept of management – levels of management – Scientific management – by FW Taylor – Principles of management- functions of management – Administration – management, Organization – types of organization(line, line & staff, staff & project) – Departmentation – Classification (centralized, decentralized, Authority, Responsibility,

and span of control – Forms of Ownership – Proprietorship – Partnership – Joint stock – Co-operative society and Government sectors.

UNIT 2 - Human resource Management

Duration 10 (L:7.5 T:2.5)

Personal Management – Staffing – Introduction to HR planning – Recruitment procedures – Types of Trainings – Personal training – skill development training – Leaderships – types – Motivation – Maslow's theory – Causes of accidents – safety precautions – Indian Factory Act – Workmen's compensation Act – Industrial disputes Act- ESI Act.

UNIT 3 - Finance Management

Duration 10 (L:7.5 T:2.5)

Introduction – Objectives of Financial Management – Types of capitals – sources of raising capital – Types of budgets – production budgets – labour budgets – Concept of Profit loss Account – Concept of balance sheet – proforma – types of taxes – brief concepts of – Income Tax, GST.

UNIT 4 - Material Management

Duration 10 (L:7.5 T:2.5)

Inventory Management – objectives of Inventory Management – ABC Analysis – Economic order Quality – Purchasing – Objectives of purchasing – Functions – Procedures – Material Management.

UNIT 5 - Project Management

Duration 10 (L:7.5 T:2.5)

Introduction – CPM & PERT – concept of Break event Analysis – quality system - Definition of Quality , concept of Quality , Quality policy, Quality control, Quality Circle, Quality Assurance, Introduction to TQM- Kaizen 5's and 6 sigma concepts, ISO 9000 series standards- Merits and drawbacks of ISO series standards.

UNIT 6- Entrepreneurship and Supporting Institutions

Duration 12 (L:9 T:3)

Qualities of entrepreneur-Manager- entrepreneur and technical entrepreneur-Advantages of being an entrepreneur-Functions of entrepreneur-Types of entrepreneur and their meaning- Role of entrepreneurship in economy development-Barriers to entrepreneurship-Mention different types of industries-Definitions of small scale industry-Features of SSI-Mention the objectives of developing SSIs-Scope of SSI in terms of various activities-Merits of SSIs-Explain the important steps involved in starting an SSI-Definition of startup company-start up development basis-state level and national level sources of information-various central Government institutions and their functions(like NSIC,SIDO,SISI and SSIB)-Telangana State industry policy-Demographic merits of Telangana state to set up SSIs-Names of state level institutions and their functions(Like SSIDC,DIC,APIITCO)-Banks that support SSIs like SIDBI,APSFC-Thrust areas and core sector as per Telangana state industry policy-Classification of the projects as per TSIP-Special assistance schemes for women and SC/ST entrepreneurs-Features of TS-IPASS.

Recommended Books

1. Industrial Engg&Management by Dr. O.P. Khanna - Dhanpath Rai & sons New Delhi
2. Business Administration &Management Dr. S.C. Saxena& W.H. Newman&E.Kirby Warren-SahityaBhavan Agra
3. The process of Management by Andrew R. McGill - Prentice Hall
4. Industrial Management by Rustom S. Davar - Khanna Publication
5. Total Quality Management, S Raja Ram, M Shivashankar
6. Industrial management and organizational behaviour, K.K.Ahuja

Suggested E-Learning references

1. <http://jiem.org/index.php/jiem>
2. <https://dipp.gov.in>
3. www.worldwidelearn.com/online-education-guide/business/industrial-management-major.html

Suggested Learning Outcomes

- 1.1 Define Business
- 1.2 State the Types of Business (Service, Manufacturing, Trade)
- 1.3 Explain about the various industrial sectors like engineering, process, textile, Agro based industries.
- 1.4 State the need for Globalization.
- 1.5 List the Advantages & Disadvantages of globalization w.r.t. India.
- 1.6 Explain the importance of Intellectual Property Rights (I.P.R.)
- 1.7 Define Management.
- 1.8 Explain the concept of management
- 1.9 Explain the Different Levels of management
- 1.10 Explain Administration & management
- 1.11 State the principles of scientific management by F.W.Taylor
- 1.12 State the principles of Management by Henry Fayol (14 principles)
- 1.13 List the Functions of Management
 - i) Planning ii) Organizing iii) Directing iv) Controlling
- 1.14 Define Organization
- 1.15 List the Types of organization :a) Line b) Line & staff c) Functional d) Project
- 1.16 Explain the four types of organization.
- 1.17 Define departmentalization.
- 1.18 Explain the following types of departmentalization
 - i) Centralized & Decentralized ii) Authority & Responsibility iii) Span of Control
- 1.19 Explain the Forms of ownership
 - i) Proprietorship ii) Partnership iii) Joint stock iv) Co-operative Society v) Govt. Sector
- 2.1 Define Personal Management.
- 2.2 Explain the functions of Personal Management

- 2.3 Define Staffing .
- 2.4 State the importance of HR Planning.
- 2.5 Explain the various Recruitment Procedures.
- 2.6 Explain the need for Training & Development .
- 2.7 State the various types of training procedures(Induction, Skill Enhancement etc)
- 2.8 State the different types of Leaderships.
- 2.9 Explain the Maslow's Theory of Motivation.
- 2.10 Explain the Causes of accident and the Safety precautions to be followed.
- 2.11 Explain the importance of various Acts – Indian Factory Act, ESI Act, Workmen Compensation Act, Industrial Dispute Act etc.

- 3.1 State the Objectives of Financial Management.
- 3.2 State the Functions of Financial Management.
- 3.3. State the necessity of Capital Generation & Management.
- 3.4 List the types of Capitals.
- 3.5 List the Sources of raising Capital.
- 3.6 Explain the Types of Budgets
 - i) Production Budget (including Variance Report) ii) Labour Budget.
- 3.7 Explain Profit & Loss Account (only concepts) .
- 3.8 Explain the proforma of Balance Sheet.
- 3.9 Explain GST and Income Tax .

- 4.1. Define Inventory Management (No Numerical).
- 4.2 State the objectives of Inventory Management.
- 4.3 Explain ABC Analysis.
- 4.4 State Economic Order Quantity.
- 4.5 Explain the Graphical Representation of Economic Order Quantity.
- 4.6 State the objectives of Purchasing.
- 4.7 State the functions of Purchase Department.
- 4.8 Explain the steps involved in Purchasing.
- 4.9 State the Modern Techniques of Material Management.

- 5.1 State the meaning of Project Management.
- 5.2 Explain the CPM & PERT Techniques of Project Management.

- 5.3 Distinguish between CPM & PERT techniques.
- 5.4 Identify the critical path and find the project duration using CPM & PERT techniques (solve problems on CPM and PERT).
- 5.5 Explain the concept of Break Even Analysis.
- 5.6 Define Quality.
- 5.7 State the concept of Quality.
- 5.8 Explain the various Quality Management systems.
- 5.9 Explain the importance of Quality policy, Quality control, Quality Circle.
- 5.10 State the principles of Quality Assurance.
- 5.11 State the concepts of TQM, Kaizen 5's and 6 sigma.
- 5.12 State the constituents of ISO 9000 series standards.
- 5.13 Merits and draw backs of ISO 9000 series standards.

- 6.1 Explain the concept of entrepreneurship.
- 6.2 Mention the qualities of entrepreneur.
- 6.3 Distinguish between manager-entrepreneur and technical entrepreneur.
- 6.4 Mention the advantages of being an entrepreneur.
- 6.5 List the functions of entrepreneur.
- 6.6 Mention the important types of entrepreneur and their meaning.
- 6.7 Explain the role of entrepreneurship in economic development.
- 6.8 Mention the barriers to entrepreneurship.
- 6.9 Mention different types of Industries.
- 6.10 Define Small scale industry.
- 6.11 List the features of SSI.
- 6.12 Mention the objectives of developing SSIs.
- 6.13 Explain the scope of SSI in terms of various activities.
- 6.14 List the merits of SSIs.
- 6.15 Explain the important steps involved in starting an SSI.
- 6.16 Define a startup company.
- 6.17 Explain various startup development phases

- 6.18 Name the state level and National level sources of information
- 6.19 Mention the various Central government institutions and their functions
(like NSIC , SIDO, SISI_SSIB)
- 6.20 Explain Telangana state industry policy.
- 6.21 Mention the demographic merits of Telangana state to set up SSIs.
- 6.22 Mention the names of State level institutions and their functions (like SSIDC, DIC, APITCO)
- 6.23 List the banks that support SSIs like SIDBI, APSFC.
- 6.24 List the thrust areas and Core sectors as per Telangana state industry policy.
- 6.25 Classify the projects as per TSIP.
- 6.26 Mention Special assistance schemes for women and SC/ST entrepreneurs.
- 6.27 Mention the features of TS-iPASS.

Suggested Student Activities

- 1.Student visits Library to refer to Management courses.
- 2.Student observes the solo and partnership business establishments near by and prepare a report about the activities.
3. Identify any one product, being manufactured in local industry, study the process they are following for manufacturing the product, submit handwritten report.
4. Visit a nearby industry, make a report on Plant layout, type of production, quality system is put in practice and quality tools they are using in work place.
5. Motivate student to take case study on plant maintenance of nearby industry, observe type of maintenance they undertake in their industry.
6. Each student should prepare a detailed project report on selected product.
7. Visit a local industry and list the safety precautions carried out there.
8. Meet a local Entrepreneur and prepare a report on his success story.
- 9.Quiz.
- 10.Group discussion.
11. Surprise test.

Execution Mode:

1. Maximum of 5 students in each batch should do any one of the following type activity or similar activity related to the course and before take up, get it approved from concerned Teacher.
2. Each batch should conduct different activity and no repeating should occur.
3. Submit a brief report on the activity done on 4-6 pages, A4 size hand written paper. Papers should be simple stapled or tagged. Avoid plastic based files for submitting of reports.
4. Activities can be carried off-class.
5. Assessment shall be made based on quality of activity/presentation/demonstration and report.

CO-PO Mapping Matrix

	Basic knowledge	Discipline Knowledge	Experiments and practice	Engineering Tools	Engineer and society	Environment & sustainability	Ethics	Individual and Team work	Communication	Lifelong learning	Linked PO
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	
CO1	2	2								3	1,2
CO2	2	2			2	3	3			2	1,2,5,6,7
CO3	2	2							3	3	1,2,9
CO4	2	2			2		3			2	1,2,5,7
CO5	2	3			2					2	1,2,5,10
CO6	2	2	2				3			3	1,2,3,7,10

Internal Evaluation

Test	Units	Marks
Mid Sem 1	1 and 2	20
Mid Sem 2	3 and 4	20
Slip Test 1	1 and 2	5
Slip Test 2	3 and 4	5
Assignments	-	5
Seminars	-	5
	Total	60

QUESTION PAPER PATTERN FOR MID SEMESTER EXAMS

Sl.No	Description	Level	No of Questions	Marks for each question	Choice	Total Marks
01	Part-A	Remembering(R)	4	1	Nil	4 Marks
02	Part-B	Understanding(U)	4	3	2	6 Marks
03	Part-C	Application(A)	4	5	2	10 Marks
Total Marks						20 Marks

MID SEM-I EXAM

S.No	Unit No	R	U	A
1	Unit-I	1,2	5(a)	7(a)
			5(b)	7(b)
2	Unit-II	3,4	6(a)	8(a)
			6(b)	8(b)
Total Questions		4	4	4

MID SEM-II EXAM

S.No	Unit No	R	U	A
1	Unit-III	1,2	5(a)	7(a)
			5(b)	7(b)
2	Unit-IV	3,4	6(a)	8(a)
			6(b)	8(b)
Total Questions		4	4	4

The length of answer for each question framed in respect of Part-A, B&C shall not exceed $\frac{1}{4}$ of a page side, 1 page side and 2page sides respectively

QUESTION PAPER PATTERN FOR SEMESTER END EXAM

Sl.No	Description	Level	No of Questions	Marks for each question	Choice	Total Marks
01	Part-A	Remembering(R)	8	1	Nil	8 Marks
02	Part-B	Understanding(U)	8	3	4	12 Marks
03	Part-C	Application(A)	8	5	4	20 Marks
Total Marks						40 Marks

Unit No	Questions to be set for SEE				
	R		U		A
I	Q4	Q1		Q9(a)	Q13(a)
II					
III		Q2		Q10(a)	Q14(a)
IV					
V		Q3	Q5,Q6	Q9(b), Q11(a), Q11(b)	Q13(b), Q15(a), Q15(b)
VI					
Total Questions	8		8	8	

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DIPLOMA IN ELECTRICAL & ELECTRONICS ENGG.
SUB CODE: 18EE-501F
INDUSTRIAL MANAGEMENT AND ENTREPRENEURSHIP

MID SEM -I EXAM MODEL PAPER

TIME: 1 HOUR

TOTAL MARKS: 20

Important Note: Wherever any question has choice, marks will be allotted only to first attempted question. **No marks will be allotted for extra questions answered**

PART – A

Marks: 4Q X 1= 04

Instructions: (1) Answer all questions
(2) Each question carries **One** mark.

1. Define business.
2. Define organization.
3. What are the different types of Leaderships?
4. Define personnel management.

PART - B

Marks: 2Q x 3 = 06

Instructions: (1) Answer all questions
(2) Each question carries **Three** marks.

5.(a) State the need for Globalization .

OR

5.(b) Briefly explain Proprietor form of business ownership.

6.(a) Briefly explain the need for Training & Development .

OR

6.(b) What are the Causes of accident in an industry.

PART - C

Marks: 2Q x 5= 10

Instructions: (1) Answer all questions
(2) Each question carries **Five** marks.

7.(a) State the principles of Scientific management by F.W.Taylor.

OR

7.(b) Explain the line and staff type of organisation.

8.(a) Explain the Maslow's Theory of Motivation.

OR

8.(b) Explain various features of Indian Factory Act.

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MID SEM -II EXAM MODEL PAPER

TIME: 1 HOUR

TOTAL MARKS: 20

Important Note: Wherever any question has choice, marks will be allotted only to first attempted question. **No marks will be allotted for extra questions answered**

PART – A

Marks: 4Q X 1= 04

Instructions: (1) Answer all questions
(2) Each question carries **One** mark.

1. List the types of Capitals.
2. Mention any two objectives of financial management.
3. Define inventory management.
4. List any two objectives of purchasing.

PART - B

Marks: 2Q x 3 = 06

Instructions: (1) Answer all questions
(2) Each question carries **Three** marks.

5. (a) What is the necessity of Capital Generation?

OR

5.(b) Briefly explain Profit & Loss Account .

6.(a) State the Modern Techniques of Material Management.

OR

6.(b) What are the steps involved in Purchasing?

PART - C

Marks: 2Q x 5= 10

Instructions: (1) Answer all questions
(2) Each question carries **Five** marks.

7.(a) Explain about production budget.

OR

7.(b) Explain the proforma of balance sheet.

8.(a) Explain ABC analysis .

OR

8.(b) Explain the Graphical Representation of Economic Order Quantity.

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SEMESTER END EXAM MODEL PAPER

TIME: 2 HOURS

TOTAL MARKS: 40

PART – A

Marks: 8Q X 1= 8

Instructions: (1) Answer all questions
(2) Each question carries **one** mark.

1. Define Staffing.
2. List the types of Capitals.
3. State the concept of Quality.
4. List the functions of entrepreneur.
5. What is meant by Project Management?
6. What is meant by Quality Assurance?
7. Define Small scale industry.
8. Define a startup company.

PART - B

Marks: 4Qx3=12

Instructions: (1) Answer any Four Questions
(2) Each question carries **Three** marks.

9.(a) Write salient features of partnership type of business ownership.

OR

9.(b) Explain briefly the importance of Quality policy .

10.(a) What is meant by GST?

OR

10.(b). Mention the barriers to entrepreneurship.

11.(a) What are the concepts of TQM?

OR

11.(b) Explain the importance of Quality control.

12.(a) Explain briefly the role of entrepreneurship in economic development.

OR

12.(b) Mention the features of TS-iPASS.

Instructions:

PART - C

- (1) Answer any Four Questions
- (2) Each question carries **Five** marks

Marks: 4Qx5=20

13.(a) Explain the principles of Management by Henry Fayol.

OR

13.(b) Explain the concept of Break Even Analysis .

14.(a) Explain the labour budget.

OR

14.(b) Explain the important steps involved in starting an SSI .

15.(a) Draw a network diagram and find out project duration for the following activities.

Activity	1-2	1-3	1-4	2-6	3-5	4-5	5-6	6-7
Duration in days	4	2	3	5	1	2	2	7

OR

15.(b) Explain the importance of quality circle .

16.(a) Explain briefly Telangana state industry policy .

OR

16.(b) What are the special assistance schemes provided for women entrepreneurs.

AC MOTORS

Course Title	: AC Motors	Course Code	: 18EE-502C
Semester	: V	Course Group	: Core
Teaching Scheme in Periods (L:T:P)	: 45:15:0	Credits	: 3
Methodology	: Lecture + Tutorial	Total Contact Periods	: 60
CIE (Continuous Internal Evaluation)	: 60 Marks	SEE (Semester End Examination)	: 40 Marks

Pre requisites

This course requires the knowledge of Basic Principles of Electricity and Magnetism,

Course Outcomes

CO1 :	Describe the construction and working of Synchronous Motor
CO2 :	Apply different starting methods and select a suitable 3 phase induction motor for particular application.
CO3 :	Describe the construction & working of 3 Phase Induction Motors
CO4 :	Draw the Torque-Slip curves and evaluate the performance of 3 phase induction Motor.
CO5 :	Apply different starting and speed control methods of 3 phase Induction Motor
CO6 :	Describe the construction & working of single Phase Motors

Blue Print of Marks for SEE

Unit No	Unit Name	Periods	Questions to be set for SEE				
			R		U	A	
1	Synchronous Motors	12	Q4	Q1	Q9(a)	Q13(a)	
2	Starters and Applications of Synchronous Motors	08					
3	3 phase Induction Motors	08		Q2	Q10(a)	Q14(a)	
4	Characteristics of 3 phase Induction Motor	12					
5	Starters and Speed Control of 3 phase Induction Motor	08		Q3	Q5,Q6	Q9(b), Q11(a), Q11(b)	Q13(b), Q15(a), Q15(b)
6	Single phase and Special purpose Motors	12					
Total		60	8		8	8	

Course Content

UNIT - 1. Synchronous Motors

Duration: 12 Periods (L: 9 -T: 3)

Introduction - Rotating Magnetic field, synchronous speed, parts of synchronous Motor – Excitation of rotor -working Principle – Back EMF – Resistance and synchronous Reactance – Effects of Load, Phasor diagrams – Load Angle, power relation, Effects of change of Excitation at constant Load, Phasor diagrams for: (a) Normal, (b)Under and c)Over excitation conditions, Effects of Excitation on Armature current and power factor, Relation between Back EMF applied voltage, Simple problems - V – Curves and inverted V – curves ,constant power lines.

UNIT - 2. Starters and Applications of Synchronous Motors

Duration : 8 Periods (L: 6 -T: 2)

Starting Device necessity – Methods of starting, phenomenon of hunting and its undesirable effects – Methods to prevent hunting - synchronous condenser- calculation of KVA / KVAR Rating – problems - Applications of synchronous motor.

UNIT – 3 Three phase Induction Motors

Duration: 8 Periods (L: 6 -T: 2)

Introduction – Constructional features – types of rotors - Principle of working & self starting features, actual rotor speed - synchronous speed – slip - Effect of loading on slip – frequency and magnitude of rotor EMF and reactance – Expression for rotor current on no load and On Load – problems - Induction motor as a generalized transformer - Losses and Power transfer stages from stator to rotor - efficiency – Relation between rotor copper losses , Rotor output and rotor input derivation and problems.

UNIT - 4. Characteristics of 3 phase Induction Motor

Duration : 12 Periods (L: 9 - T: 3)

Torque equation – Starting torque - condition for maximum torque – Relation Between full load torque, starting Torque and maximum torque – Torque slip curves – modes of operation of induction machine – braking of induction motor (no derivation and problems) - effects and variation of rotor resistance and reactance on starting, full load and maximum torque - Effect of supply voltage on torque and speed – problems - No load and blocked rotor tests - circle diagram from test data – Evaluation of torque – efficiency - problems.

UNIT - 5 Starters and Speed Control of 3-phase Induction Motor

Duration : 8 Periods (L: 6 -T: 2)

Starters for Induction motor – necessity of starters - Direct Switching - D.O.L starter - Star / Delta starter - Auto Transformer starter - rotor resistance starters- Block Diagram of soft starter –Advantages and Disadvantages- Double cage rotor motor – Improvement in performance features - Speed variation of induction motors - Application of induction motors - Comparison of Synchronous and induction motors.

UNIT - 6 Single phase and Special purpose Motors

Duration : 12 Periods (L: 9 - T: 3)

Essential parts and constructional features of single phase motors – self starting -split phase, capacitor start - capacitor run - shaded pole induction motor- Principle of working – Accessories like capacitors, centrifugal switch – function –reversal of rotation - Applications - relative merits - A.C series motor – principles of working – sparking elimination methods - applications - Universal motor- principle of working, speed control and applications- Stepper motor-principle of working and applications- Servo motor - principle of working and applications – linear induction motors – principle of working and applications – BLDC and PMDC motors – principle of working and applications

Recommended Books

1. Electrical Technology by B.L. Theraja
2. Electrical Technology by J.B. Gupta
3. Electrical Technology by H. Cotton
4. Performance and design of A.C. Machines by M.G, Say
5. Performance of A.C. Machines by Langsdorf
6. Electrical motors applications and control by M.V. Deshpande

Suggested E-Learning references

1. <http://electrical4u.com/>
2. www.nptel.ac.in
3. <https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/>

Suggested Learning Outcomes

After completion of the subject, the student shall be able to

- 1.1 State the Principle of Production of Rotating Magnetic Field in 3-phase System.
- 1.2 Describe the construction of synchronous motor.
- 1.3 State the parts of synchronous motor and explain.
- 1.4 Explain the principle of working of synchronous motor.
- 1.5 Describe the performance of synchronous motor on Load with phasor diagrams.
- 1.6 Explain the effects of varying excitation at constant load with phasor diagrams.
- 1.7 Describe the significance of 'V' curve.
- 1.8 Draw the 'V' curves for different loads.
- 1.9 Describe the significance of inverted 'V' curve.
- 1.10 Draw the inverted 'V' curve for different loads.

- 2.1 Explain the starting method of synchronous motor by Auxiliary motor.
- 2.2 Explain the starting method of synchronous motor by Damper winding.
- 2.3 Describe the phenomenon of HUNTING.
- 2.4 State "How HUNTING is prevented"?

- 2.5 Explain how a Synchronous motor can be used as a Synchronous condenser.
- 2.6 Solve simple problems on power factor correction.
- 2.7 State the applications of synchronous motor.

- 3.1 Explain the advantages of Induction Motors.
- 3.2 Describe the construction of slip ring Induction motor.
- 3.3 Explain the construction of squirrel cage Induction motor.
- 3.4 State the working principle of 3 phase induction motor.
- 3.5 Explain working of 3 phase induction motor on no load.
- 3.6 Describe working of 3 phase induction motor on Load.
- 3.7 Explain how an induction motor is treated as a generalized transformer.
- 3.8 Describe Power flow diagram and Efficiency.
- 3.9 Solve simple problems on Power and Efficiency.

- 4.1 Derive Torque Equation
- 4.2 Draw Torque – Slip characteristics of induction motor.
- 4.3 List various modes of operation of induction machine.
- 4.4 Name different braking methods.
- 4.5 Describe the plugging of three phase induction motor.
- 4.6 Describe the rheostatic braking of three phase induction motor.
- 4.7 Describe the regenerative braking of three phase induction motor.
- 4.8 Derive the expression for full load torque.
- 4.9 Explain the expression for starting torque.
- 4.10 Derive the expression for maximum torque.
- 4.11 Derive the relation between full load torque, starting Torque and maximum torque.
- 4.12 Solve simple problems on Torque.
- 4.13 Explain No-load test on induction motor.
- 4.14 Describe blocked rotor test on induction motor.
- 4.15 Draw circle diagram with the help of no-load and blocked rotor tests.
- 4.16 Solve problems on circle diagram.

- 5.1 List different types of starters used for induction motors.
- 5.2 Sketch the circuit diagram and explain the working of D.O.L. starter.
- 5.3 Sketch the circuit diagram and explain the working of Star/Delta Starter.

- 5.4 Sketch the circuit diagram and explain the working of Auto - Transformer starter.
- 5.5 Sketch the circuit diagram and explain the working of Rotor resistance starter.
- 5.6 Explain the working of Soft starter with block diagram
- 5.7 State the advantages of soft starter over conventional starters.
- 5.8 Explain construction features of double cage rotor motor.
- 5.9 Describe the speed control of inductor motors by Frequency changing.
- 5.10 Explain the speed control of inductor motors by Pole changing method.
- 5.11 Describe the speed control of inductor motors by Injecting voltage in rotor circuit.
- 5.12 Explain the speed control of inductor motors by Cascading method.
- 5.13 State the applications of inductor motors
- 5.14 Compare synchronous motors with induction motors.

- 6.1 State the types of single phase induction motors.
- 6.2 Describe the constructional features of single phase induction motor.
- 6.3 Explain the principle of working of single phase Induction motor by double field revolving theory.
- 6.4 Describe the principle of working of single phase Induction motor by cross field theory.
- 6.5 Why a Single-phase Induction motor is not Self starting?
- 6.6 Describe the working of split phase motor
- 6.7 Describe the working of capacitor start motor
- 6.8 Describe the working of capacitor run motor
- 6.9 Mention the differences between capacitor start and capacitor run induction motors
- 6.10 Describe the working of shaded pole motor
- 6.11 State the applications of single phase induction motors
- 6.12 Compare single phase with three phase induction motors
- 6.13 Explain the working of linear induction motor.
- 6.14 State the applications of linear induction motor
- 6.15 Describe the working of single phase AC Series motor.
- 6.16 Explain the methods to eliminate sparking in AC series motor.
- 6.17 State the applications of single phase AC Series motor.
- 6.18 Explain the working of universal motor.
- 6.19 Explain the speed control of universal motor.
- 6.20 State the applications of single phase universal motor.
- 6.21 Explain the principle of working of Stepper motor.

- 6.22 State the applications of Stepper motor.
- 6.23 Describe the principle of working of Servo motor.
- 6.24 State the applications of Servo motor.
- 6.25 Describe the principle of working of PMDC motor.
- 6.26 State the applications of PMDC motor.
- 6.27 Describe the principle of working of BLDC motor.
- 6.28 State the applications of BLDC motor.

Suggested Student Activities

1. Student visits Library to refer to Electrical Manuals
2. Student visits the Lab to identify the available electrical equipments
3. Each Student has to prepare and submit at least 3 pages of self hand written report on (Construction details, type of windings used, Insulating materials used, applications etc.,) Preferably by visiting a nearby Substation/ Power station/ Industry/ Factory etc., considering any one of the following topics.
 - (a). 3-ph Induction motor- Squirrel-cage and Slip-ring type.
 - (b). Speed control of Induction motor.
 - (c). Types of Starters.
 - (d). 3-ph Synchronous Motors.
 - (e). 1-ph motors...
4. Quiz
5. Group Discussion
6. Surprise Test

CO-PO Mapping Matrix

	Basic knowledge	Discipline Knowledge	Experiments and practice	Engineering Tools	Engineer and society	Environment & sustainability	Ethics	Individual and Team work	Communication	Lifelong learning	Linked PO
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	
CO1	2	2	2							3	1,2,3,10
CO2		2	3		2					2	2,3,5,10
CO3	2	2	3							3	1,2,3,10
CO4	2	2	3		2					2	1,2,3,5,10
CO5		3	3		2					2	2,3,5,10
CO6	2	2	3		3					3	1,2,3,5,10

Internal Evaluation

Test	Units	Marks
Mid Sem 1	1 and 2	20
Mid Sem 2	3 and 4	20
Slip Test 1	1 and 2	5
Slip Test 2	3 and 4	5
Assignments	-	5
Seminars	-	5

	Total	60
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QUESTION PAPER PATTERN FOR MID SEMESTER EXAMS

Sl.No	Description	Level	No of Questions	Marks for each question	Choice	Total Marks
01	Part-A	Remembering(R)	4	1	Nil	4 Marks
02	Part-B	Understanding(U)	4	3	2	6 Marks
03	Part-C	Application(A)	4	5	2	10 Marks
Total Marks						20 Marks

MID SEM-I EXAM

S.No	Unit No	R	U	A	Remarks
1	Unit-I	1,2	5(a)	7(a)	
			5(b)	7(b)	
2	Unit-II	3,4	6(a)	8(a)	
			6(b)	8(b)	
Total Questions		4	4	4	

MID SEM-II EXAM

S.No	Unit No	R	U	A	Remarks
1	Unit-III	1,2	5(a)	7(a)	
			5(b)	7(b)	
2	Unit-IV	3,4	6(a)	8(a)	
			6(b)	8(b)	
Total Questions		4	4	4	

**The length of answer for each question framed in respect of Part-A, B&C shall not exceed
¼ of a page side, 1 page side and 2page sides respectively**

QUESTION PAPER PATTERN FOR SEMESTER END EXAM

Sl.No	Description	Level	No of Questions	Marks for each question	Choice	Total Marks
01	Part-A	Remembering(R)	8	1	Nil	8 Marks
02	Part-B	Understanding(U)	8	3	4	12 Marks
03	Part-C	Application(A)	8	5	4	20 Marks
Total Marks						40 Marks

Unit No	Questions to be set for SEE				
	R		U		A
I	Q4	Q1		Q9(a)	Q13(a)
II					
III		Q2		Q10(a)	Q14(a)
IV					
V		Q3	Q5,Q6	Q9(b), Q11(a), Q11(b)	Q13(b), Q15(a), Q15(b)
VI			Q7,Q8	Q10(b), Q12(a), Q12(b)	Q14(b), Q16(a), Q16(b)
Total Questions	8		8		8

18EE-502C

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TELANGANA
DIPLOMA IN ELECTRICAL & ELECTRONICS ENGG.

SUB CODE: 18EE-502C

AC MOTORS

MID SEM -I EXAM MODEL PAPER

TIME: 1 HOUR.

TOTAL MARKS: 20

PART – A

Marks: 4 X 1 = 4

Instructions: (1) Answer all questions
(2) Each question carries **one** mark.

1. Define 'V' curve.
2. On which parameters inverted 'V' curve is drawn.
3. Why damper winding is used.
4. List any two applications of synchronous motor.

PART - B

Marks: 2 x 3 = 6

Instructions: (1) Answer **all** questions.
(2) Each question carries **three** marks.

- 5.(a) State the parts of synchronous motor

OR

- 5.(b) Describe the significance of inverted 'V' curve.

- 6.(a) Explain the phenomenon of HUNTING.

OR

6. (b) State "How HUNTING is prevented"?

PART - C

Marks: 2 x 5 = 10

Instructions: (1) Answer **all** questions.
(2) Each question carries **five** marks.

- 7.(a). Explain the principle of working of synchronous motor.

OR

- 7.(b). Describe the construction of synchronous motor.

- 8.(a). Explain the starting method of synchronous motor by Auxiliary motor.

OR

- 8.(b). Explain how a Synchronous motor can be used as a Synchronous condenser.

18EE-502C

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TELANGANA
DIPLOMA IN ELECTRICAL & ELECTRONICS ENGG.

SUB CODE: 18EE-502C

AC MOTORS

MID SEM -II EXAM MODEL PAPER

TIME: 1 HOUR.

TOTAL MARKS: 20

PART – A

Marks: 4 X 1 = 4

Instructions: (1) Answer all questions
(2) Each question carries **one** mark.

1. Write the types of three phase induction motors.
2. In which type of three phase induction motor adding of external resistance is not possible.
3. Write the expression for starting torque.
4. Write the tests on three phase induction motor.

PART - B

Marks: 2 x 3 = 6

Instructions: (1) Answer all questions.
(2) Each question carries **three** marks.

- 5.(a). Write the Power flow diagram of three phase induction motor.

OR

- 5.(b). Write the advantages of three phase induction motors.

- 6.(a). Draw the Torque - Slip characteristics of induction motor.

OR

- 6.(b). Derive the expression for maximum torque

PART - C

Marks: 2 x 5 = 10

Instructions: (1) Answer **all** questions.
(2) Each question carries **five** marks.

- 7.(a). Explain the construction of slip ring Induction motor.

OR

- 7.(b). Explain the working principle of squirrel cage Induction motor

- 8.(a). Explain the procedure to conduct No-load test on induction motor.

OR

- 8.(b). Explain the procedure to conduct blocked rotor test on induction motor

18EE-502C

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TELANGANA
DIPLOMA IN ELECTRICAL & ELECTRONICS ENGG.

SUB CODE: 18EE-502C

AC MOTORS

SEMESTER END EXAM MODEL PAPER

TIME: 2 HOURS

TOTAL MARKS: 40

PART – A

Marks : 8 X 1 = 8

Instructions: (1) Answer all questions
(2) Each question carries **one** mark.

1. Draw inverted 'V' curves for different loads.
2. What are the types of three phase induction motors.
3. List any two starters used for three-phase induction motor.
4. Draw the graph between armature current and field current of three-phase synchronous motor.
5. List any two methods of speed control of three-phase squirrel cage induction motor.
6. Suggest suitable starter for a three-phase 10 HP induction motor.
7. Write the types of starting methods of single phase induction motor.
8. State any two applications of Stepper motor.

PART - B

Marks: 4 × 3 = 12

Instructions: (1) Answer all questions.
(2) Each question carries **three** marks.

9.(a) State the parts of synchronous motor

OR

9.(b) Draw the sketch of D.O.L. starter

10.(a) Write any six advantages of Induction Motors

OR

10.(b) State the types of single phase induction motors.

11.(a) Draw the sketch of Auto - Transformer starter

OR

11.(b) State the applications of three phase inductor motors.

12.(a) State the working principle of single phase universal motor

OR

12.(b) State the applications of Stepper motor.

PART – C

Marks: $4 \times 5 = 20$

Instructions: (1) Answer all questions.
(2) Each question carries **five** marks.

13.(a) Explain the performance of synchronous motor on Load with phasor diagrams

OR

13. (b) Sketch the circuit diagram and explain the working of Rotor resistance starter

14.(a) Derive the relation between full load torque, starting Torque and maximum torque.

OR

14.(b) Explain the working of capacitor start motor

15.(a) Explain the speed control of induction motor by change of frequency.

OR

15.(b) Compare synchronous motors with induction motors

16.(a) Explain the methods to eliminate sparking in single phase AC Series motor

OR

16.(b) Explain the working of PMDC motor

INDUSTRIAL ELECTRONICS

Course Title	: Industrial Electronics	Course Code	: 18EE-503E(A)
Semester	: V	Course Group	: Elective
Teaching Scheme in Periods (L:T:P)	: 45:15:0	Credits	: 3
Methodology	: Lecture + Tutorial	Total Contact Periods	: 60
CIE (Continuous Internal Evaluation)	: 60 Marks	SEE (Semester End Examination)	: 40 Marks
This course is common with DECE – 18EC-502C			

Pre requisites

This course requires the knowledge of electronic devices and semiconductor devices operation

Course Outcomes

CO1 :	Compare various power electronic device characteristics; identify their Application and identify the use of UPS and SMPS.
CO2 :	Identify the use of choppers, rectifiers and inverters.
CO3 :	Apply sensor for various applications
CO4 :	Explain different welding techniques
CO5 :	Use the concepts of PLC & SCADA for industrial applications
CO6 :	Develop an understanding of control systems

Blue Print of Marks for SEE

Unit No	Unit Name	Periods	Questions to be set for SEE				
			R		U	A	
1	Power Electronic Devices	12	Q4	Q1	Q9(a)	Q13(a)	
2	Choppers, rectifiers and inverters	08					
3	Transducers & Ultrasonics	10		Q2	Q10(a)	Q14(a)	
4	Industrial Heating &Welding	10					
5	PLCs & Programming	12		Q3	Q5,Q6	Q9(b), Q11(a), Q11(b)	Q13(b), Q15(a), Q15(b)
6	Control Engineering	8					
Total		60	8		8	8	

Course Content

UNIT 1 - Power Electronic Devices

Duration: 12 Periods (L: 9– T:3)

Different thyristor family devices- circuit symbols - Constructional details of SCR- Working of SCR using two Transistor analogy- Volt-Ampere characteristics of SCR- Ratings of SCR- forward break over voltage, latching current, holding current, turn on triggering time, turn off time of SCR- volt-ampere characteristics of Diac & Triac under forward/Reverse bias- SUS, SBS, SCS & LASCR- SCR circuit triggering by UJT - input and Output waveforms- Use of SCR in single phase and three phase Power rectifiers- Volt-ampere characteristics of Diac - Volt-ampere characteristics of Triac- Phase control circuit using Diac and Triac for AC power control- input and output waveforms. Need for protection of power devices- Important specifications of power electronic devices from Manufacturer's data sheet - Important applications of power electronic devices- working of a) Off Line UPS b) Online UPS- PWM Voltage control of UPS- Limitations of series Voltage regulated power supplies- Working of SMPS with block diagram- Applications of SMPS- Working of Servo stabilizer .

UNIT 2 - Choppers, rectifiers and inverters.

Duration:08 Periods (L: 6– T:2)

Need for a chopper- types of choppers- principle of operation of choppers-need for a controlled rectifier- single phase half-wave controlled rectifier- single phase full -wave controlled rectifier- 3-phase half-wave controlled rectifier- 3- phase full -wave controlled rectifier-Define inverters- need for an inverter- types of inverters- series inverter- parallel inverter.

UNIT 3 - Transducers &Ultrasonics

Duration:10 Periods (L: 7.5– T:2.5)

Classification of transducers on the basis of principle of operation and applications- Working principle, construction and applications of strain gauge- Working principle, construction and applications of potentiometric transducer- Working principle, construction of capacitive and inductive transducers- Important applications of transducers- Working principle, construction and applications of LVDT- Working principle and construction of Piezo electric transducer-Uses for the Piezo electric transducer- Working principle of RTD & Thermocouple transducer- Important applications of above transducers- Application of transducer in Accelerometer, servomotors, and Tachogenerators-Methods of generating ultrasonic waves-Draw and explain pulsed-echo ultrasonic flaw detector- Principle of MEMS devices- Their uses in modern smart phones and other devices.

UNIT 4 - Industrial Heating &Welding

Duration:10 Periods (L: 7.5– T:2.5)

Industrial heating methods- Principle of induction heating- Applications of induction heating-HF power source for induction heating - Principle of dielectric heating- Electrodes used in dielectric heating & method of coupling to RF generator- Applications of dielectric heating. Welding- types of Electrical welding- Principle of resistive welding- Circuit of AC resistive welding - Applications of resistive welding- Other welding Techniques.

UNIT 5 - PLCs & Programming

Duration:12 Periods (L: 9– T:3)

Need for PLC- principle of PLCs- advantages and disadvantages of PLC's- functional block diagram of PLC- Ladder diagrams and sequence listing- ladder diagram for OR, AND, XOR logic and PLC code- importance of PLC timers with examples. importance of PLC counters with examples- features of popular PLCs like Siemens , Allenbradly- applications of PLCS- importance of SCADA- typical SCADA system- applications of SCADA.

UNIT 6 - Control Engineering

Duration:8 Periods (L: 6– T:2)

Definition of the System and Control system and its classification- Basic block diagram of control system-Open loop control system with examples-Merits and demerits of open loop control- Closed loop system with the help of a block diagram- Examples for closed loop system- Comparison of Open and closed loop control systems- Transfer function-block diagram reduction techniques- simple problems on reduction techniques.

Recommended Books

1. Power Electronics by P.C.Sen Tata McGraw-Hill Education
2. Industrial Electronics and Control by S.K.Bhattacharya, S.Chatterjee TTTI Chandigarh –TES
3. Industrial And Power Electronics (Paperback) By: G. K. Mithal (Author) | Khanna Publishers
4. Control Systems Engineering by I. J. Nagrath And M. Gopal New Age Publisher, New Delhi
5. PLCs & SCADA : Theory and Practice by Rajesh Mehra, Vikrant Vij- Laxmi Publications

Suggested E-Learning references

1. <http://electrical4u.com/>
2. www.nptel.ac.in
3. www.Techopedia.com
4. www.circuitdigest.com

Suggested Learning Outcomes

Upon completion of this course a student should be able to

- 1.1 List different thyristor family devices.
 - 1.2 Sketch the circuit symbols for each device.
 - 1.3 Explain constructional details of SCR.
 - 1.4 Explain the working of SCR using two Transistor analogy.
 - 1.5 Explain the Volt-Ampere characteristics of SCR.
 - 1.6 Mention the important ratings of SCR.
 - 1.7 Define *forward break over voltage*, *latching current*, *holding current*, *turn on triggering time*, *turn off time* of SCR.
 - 1.8 Distinguish between SUS, SBS, SCS & LASCR
 - 1.9 Explain SCR circuit triggering by UJT with a circuit diagram and Draw input and Output waveforms.
 - 1.10 Mention the use of SCR in single phase and three phase Power rectifiers.
 - 1.11 Explain the working and Volt-ampere characteristics of Diac
 - 1.12 Explain the working and Volt-ampere characteristics of Triac.
 - 1.13 Explain the Phase control circuit using Diac and Triac for AC power control and Draw the input and output waveforms.
 - 1.14 Give important specifications of power electronic devices from Manufacturer's data sheet.
 - 1.15 List the six important applications of power electronic devices.
 - 1.16 With a block diagram explain the working of a) Off Line UPS b) Online UPS
 - 1.17 Explain the limitations of series Voltage regulated power supplies
 - 1.18 Explain the working of SMPS with block diagram
 - 1.19 Mention any 3 applications of SMPS.
 - 1.20 Explain the working of Servo stabilizer.
-
- 2.1 Define choppers.
 - 2.2 What is the need for a chopper?
 - 2.3 List the types of choppers.
 - 2.4 Explain the principle of operation of choppers.
 - 2.5 What is the need for a controlled rectifier?

- 2.6 Draw and explain the principle of operation of single phase half-wave controlled rectifier.
- 2.7 Draw and explain the principle of operation of single phase full -wave controlled rectifier.
- 2.8 Draw and explain the principle of operation of 3-phase half-wave controlled rectifier.
- 2.9 Draw and explain the principle of operation of 3- phase full -wave controlled rectifier.
- 2.10 Define inverters.
- 2.11 What is the need for an inverter?
- 2.12 List the types of inverters.
- 2.13 Draw and explain the operation of series inverter.
- 2.14 Draw and explain the operation of parallel inverter.

- 3.1 Classify transducers on the basis of principle of operation and applications.
- 3.2 Explain the working principle, construction and applications of strain gauge.
- 3.3 Explain the working principle, construction and applications of potentiometric transducer.
- 3.4 Explain the working principle, construction of capacitive and inductive transducers.
- 3.5 Mention the 6 important applications of above transducers.
- 3.6 Explain the working principle, construction and applications of LVDT.
- 3.7 Explain the working principle and construction of Piezo electric transducer.
- 3.8 List any 3 uses for the Piezo electric transducer
- 3.9 Explain the working principle of RTD & Thermocouple transducer.
- 3.10 Mention any 6 important applications of above transducers.
- 3.11 Explain the application of transducer in Accelerometer, servomotors, and Tachogenerators.
- 3.12 Draw and explain pulsed-echo ultrasonic flaw detector
- 3.13 Explain the principle of MEMS devices
- 3.14 Mention their use in modern smart phones and other devices

- 4.1 Classify industrial heating methods.

- 4.2 Explain the principle of induction heating.
- 4.3 List four applications of induction heating.
- 4.4 Draw the circuit of HF power source for induction heating and explain its working.
- 4.5 Explain the principle of dielectric heating.
- 4.6 Explain the electrodes used in dielectric heating & method of coupling to RF generator.
- 4.7 Mention the applications of dielectric heating.
- 4.8 Define welding.
- 4.9 List 4 types of Electrical welding
- 4.10 Explain the principle of resistive welding.
- 4.11 Draw the basic circuit of AC resistive welding and explain its working.
- 4.12 Mention applications of resistive welding.
- 4.13 Mention the applications of other welding Techniques.

- 5.1 Explain the need for PLC
- 5.2. Explain the basic principle of PLCs.
- 5.3. List out the advantages and disadvantages of PLC's.
- 5.4. Draw and explain the functional block diagram of PLC.
- 5.5. Explain the Ladder diagrams and sequence listing.
- 5.6. Draw ladder diagram for OR logic and write the PLC code.
- 5.7. Draw ladder diagram for AND logic and write the PLC code.
- 5.8. Draw ladder diagram for XOR logic and write the PLC code
- 5.9. Explain the importance of PLC timers with examples.
- 5.10. Explain the importance of PLC counters with examples.
- 5.11. List the features of popular PLCs like Siemens , Allenbradly .
- 5.12. List any 4 applications of PLCS in the industry.
- 5.13. Mention the importance of SCADA.
- 5.14. Explain a typical SCADA system.
- 5.15. List the applications of SCADA.

- 6.1 Define system and Control system.
- 6.2. Classify control systems
- 6.3. Explain the basic block diagram of control system
- 6.4. Explain an open loop control system.

- 6.5. Give examples for open loop control system.
- 6.6. Give three merits and demerits of open loop control.
- 6.7. Explain the closed loop system with the help of a block diagram.
- 6.8. Give Examples for closed loop system
- 6.9. Compare Open loop and closed loop control systems.
- 6.10. Define Transfer function
- 6.11. Explain block diagram reduction techniques.
- 6.12. Solve simple problems using the above techniques.

Suggested Learning Outcomes

1. Collect specifications and data sheets of various power electronic components.
2. Analyze the various components used and connections in the UPS available in the Institution facility.
3. Compare various welding techniques and their relevance to situation
4. Participate in the Quiz & discussion
5. Search internet for knowing latest trends in industrial electronics
6. Student visits to Library to refer to Manuals and related books of industrial electronics.

CO-PO Mapping Matrix

	Basic knowledge	Discipline Knowledge	Experiments and practice	Engineering Tools	Engineer and society	Environment & sustainability	Ethics	Individual and Team work	Communication	Lifelong learning	Linked PO
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	
CO1	3	2								2	1,2,10
CO2		2		2						2	2,4,10
CO3		2		2						2	2,4,10
CO4		2		2						2	2,4,10
CO5		2		2	2					2	2,4,5,10
CO6		2		2	2					2	2,4,5,10

Internal Evaluation

Test	Units	Marks
Mid Sem 1	1 and 2	20
Mid Sem 2	3 and 4	20
Slip Test 1	1 and 2	5
Slip Test 2	3 and 4	5
Assignments	-	5
Seminars	-	5
	Total	60

QUESTION PAPER PATTERN FOR MID SEMESTER EXAMS

Sl.No	Description	Level	No of Questions	Marks for each question	Choice	Total Marks
01	Part-A	Remembering(R)	4	1	Nil	4 Marks
02	Part-B	Understanding(U)	4	3	2	6 Marks
03	Part-C	Application(A)	4	5	2	10 Marks
Total Marks						20 Marks

MID SEM-I EXAM

S.No	Unit No	R	U	A
1	Unit-I	1,2	5(a)	7(a)
			5(b)	7(b)
2	Unit-II	3,4	6(a)	8(a)
			6(b)	8(b)
Total Questions		4	4	4

MID SEM-II EXAM

S.No	Unit No	R	U	A
1	Unit-III	1,2	5(a)	7(a)
			5(b)	7(b)
2	Unit-IV	3,4	6(a)	8(a)
			6(b)	8(b)
Total Questions		4	4	4

The length of answer for each question framed in respect of Part-A, B&C shall not exceed $\frac{1}{4}$ of a page side, 1 page side and 2page sides respectively

QUESTION PAPER PATTERN FOR SEMESTER END EXAM

Sl.No	Description	Level	No of Questions	Marks for each question	Choice	Total Marks
01	Part-A	Remembering(R)	8	1	Nil	8 Marks
02	Part-B	Understanding(U)	8	3	4	12 Marks
03	Part-C	Application(A)	8	5	4	20 Marks
Total Marks						40 Marks

Unit No	Questions to be set for SEE				
	R		U		A
I	Q4	Q1		Q9(a)	Q13(a)
II					
III		Q2		Q10(a)	Q14(a)
IV					
V		Q3	Q5,Q6	Q9(b), Q11(a), Q11(b)	Q13(b), Q15(a), Q15(b)
VI				Q10(b), Q12(a), Q12(b)	Q14(b), Q16(a), Q16(b)
Total Questions	8		8		8

18EE-503E(A)

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TELANGANA
DIPLOMA IN ELECTRICAL & ELECTRONICS ENGG.
SUB CODE: 18EE-503E(A)
INDUSTRIAL ELECTRONICS

MID SEM -I MODEL PAPER

TIME: 1 HOUR

TOTAL MARKS: 20

PART – A

Marks: 4Q X 1= 4

Instructions: (1) Answer all questions
(2) Each question carries **one** mark.

1. List different thyristor family devices
2. Draw the symbol of SCR, SCS.
3. Define choppers.
4. List the types of Inverters.

PART - B

Marks: 2Q x 3 = 6

Instructions: (1) Answer **all** questions.
(2) Each question carries **three** marks.

- 5.(a) Explain the Volt-Ampere characteristics of SCR.

(OR)

- 5.(b) Explain the Volt-Ampere characteristics of Triac

- 6.(a). Explain the need for a controlled rectifier.

(OR)

- 6.(b) Explain the working principle of Chopper.

PART - C

Marks: 2Q x 5= 10

Instructions: (1) Answer **all** questions.
(2) Each question carries **five** marks.

- 7.(a) Explain the working of SCR using two Transistor analogy.

(OR)

- 7.(b) Explain the Phase control circuit using Diac and Triac for AC power control.

- 8.(a) Explain the working of 3-phase half wave controlled rectifier.

(OR)

- 8.(b). Explain the working of SMPS with block diagram

18EE-503E(A)

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TELANGANA
DIPLOMA IN ELECTRICAL & ELECTRONICS ENGG.
SUB CODE: 18EE-503E(A)
INDUSTRIAL ELECTRONICS

MID SEM –II MODEL PAPER

TIME: 1 HOUR

TOTAL MARKS: 20

PART – A

Marks: 4Q X 1 = 4

Instructions: (1) Answer all questions
(2) Each question carries **one** mark.

1. Classify transducers on the basis of principle of operation
2. List any 3 uses for the Piezo electric transducer
3. Classify industrial heating methods
4. Define welding.

PART - B

Marks: 2Q x 3 = 6

Instructions: (1) Answer all questions.
(2) Each question carries **three** marks.

- 5.(a) Explain the principle of MEMS devices
(OR)
- 5.(b) Explain the working principle of RTD
- 6.(a) Explain the principle of resistive welding.
(OR)
- 6.(b). Explain the principle of dielectric heating

PART - C

Marks: 2Q x 5 = 10

Instructions: (1) Answer **all** questions.
(2) Each question carries **five** marks.

- 7.(a) Explain the working principle, construction of LVDT.
(OR)
- 7.(b) Explain the working principle, construction of strain gauge.
- 8.(a) Draw the circuit of HF power source for induction heating and explain its working.
(OR)
- 8.(b). Draw the basic circuit of AC resistive welding and explain its working.

18EE-503E(A)

STATE BOARD OF TECHNICAL EDUCATION & TRAINING , TELANGANA
DIPLOMA IN ELECTRICAL & ELECTRONICS ENGG.
SUB CODE: 18EE-503E(A)
INDUSTRIAL ELECTRONICS
SEMESTER END EXAM MODEL PAPER

TIME: 2 HOURS

TOTAL MARKS: 40

PART – A

Marks : 8Q X 1= 8

Instructions: (1) Answer all questions
(2) Each question carries **one** mark.

1. Mention any two applications of SMPS
2. List 4 types of Electrical welding.
3. List types of PLCs.
4. State the need for PLC.
5. List any two applications of PLCs in the industry.
6. List 2 applications of SCADA.
7. Define control system.
8. Define Transfer function.

PART - B

Marks: 4Q×3=12

Instructions: (1) Answer all questions.
(2) Each question carries **three** marks.

9.(a) Draw the Volt-ampere characteristics of Diac and Triac.
(OR)

9. (b) Explain the basic principle of PLC..

10. (a) Classify transducers on the basis of principle of operation and applications
(OR)

10.(b) Classify control systems and give examples for each control system.

11. (a) Draw the ladder diagram for XOR logic and write the PLC code.
(OR)

11.(b) Explain the importance of SCADA system.

12. (a) Compare Open loop and closed loop control systems.
(OR)

12. (b) Explain the basic block diagram of control system.

PART – C

Marks: $4Q \times 5 = 20$

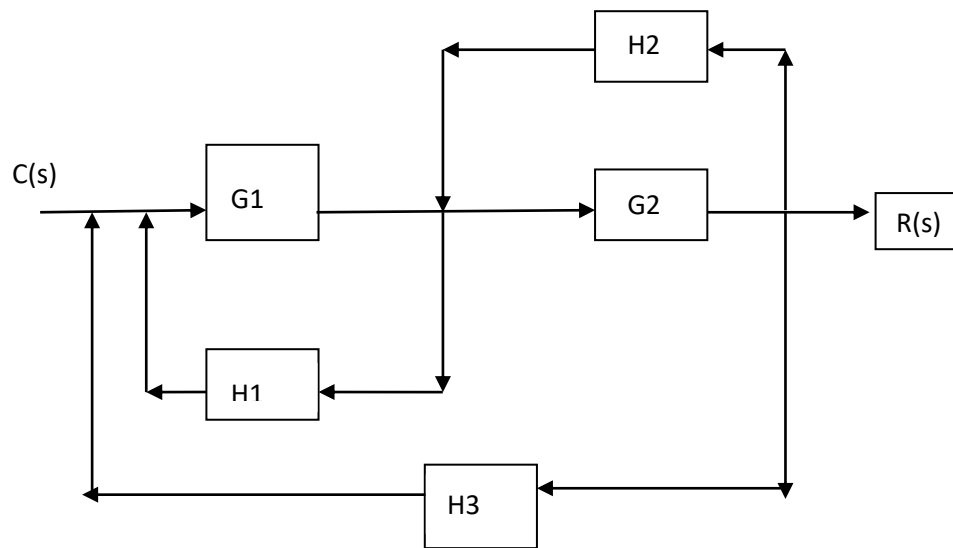
Instructions: (1) Answer all questions.
(2) Each question carries **five** marks.

13.(a) Explain the working of online UPS with the help of block diagram.
(OR)

13. (b) Explain the importance of PLC timers with an example.

14. (a) Explain the principle of resistive welding.
(OR)

14.(b) Find the transfer function for the given block diagram.



15. (a) Draw and explain the functional block diagram of PLC.
(OR)

15.(b) Explain basic SCADA system.

16. (a) Explain the closed loop system with the help of a block diagram
(OR)

16. (b) Explain the open loop system with the help of a block diagram.

POWER ELECTRONICS

Course Title	: Power Electronics	Course Code	: 18EE-503E(B)
Semester	: V	Course Group	: Elective
Teaching Scheme in Periods (L:T:P)	: 45:15:0	Credits	: 3
Methodology	: Lecture + Tutorial	Total Contact Periods	: 60
CIE (Continuous Internal Evaluation)	: 60 Marks	SEE (Semester End Examination)	: 40 Marks

Pre requisites

This course requires the knowledge of Electronics engineering(Semiconductor devices and circuits) and Electrical Machines (DC and AC).

Course Outcomes

CO1 :	Compare different power electronic devices and select the device based on the requirement
CO2 :	Use different Converters circuits as per requirement.
CO3 :	Acquire the knowledge to construct AC regulators and Choppers circuits.
CO4 :	Acquire the knowledge to construct and use Inverters and Cyclo-converters circuits.
CO5 :	Apply the power electronic drives for speed control of DC / AC Motors and compare specific power electronics drives.
CO6 :	Apply power electronic circuits for specific applications

Blue Print of Marks for SEE

Unit No	Unit Name	Periods	Questions to be set for SEE			
			R		U	A
1	Power Electronic Devices	10	Q4	Q1	Q9(a)	Q13(a)
2	Converters	10				
3	A.C Voltage regulators and Choppers	08		Q2	Q10(a)	Q14(a)
4	Inverters &Cyclo-converters	12				
5	Speed Control of DC and AC Motors	08		Q3	Q9(b), Q11(a), Q11(b)	Q13(b), Q15(a), Q15(b)
6	Applications of Power Electronic Circuits	12				
Total		60	8		8	8

Course Content

UNIT 1 - Power Electronic Devices

Duration: 10 Periods (L: 7.5 - T: 2.5)

ISI circuit symbols for each device in thyristor family – Construction, Working principle and static VI characteristics of devices: SCR, GTO SCR- comparison between SCR and GTO SCR- Two transistor analogy of SCR , Gate characteristics of SCR, Ratings of SCR: Forward break over voltage, latching current, holding current, turn on time, turn off time – advantages of SCR as switch -static VI characteristics and working of DIAC, TRIAC, IGBT - applications of SCR, GTO SCR, DIAC, TRIAC, IGBT, LASCR - triggering of SCR using UJT - Necessity of Commutation- various methods of Thyristor Commutation techniques.

UNIT 2– Converters

Duration: 10 Periods (L: 7.5 – T: 2.5)

Classification of converters, Advantages and disadvantages of power electronic converters- single phase half wave controlled converter with R load, R-L load, Need of freewheeling diode- single phase half wave controlled converter with R-L load with freewheeling diode, single phase full wave full controlled converter with R load, R-L load - three phase half wave converter with R load.

UNIT 3 – A.C Voltage regulators and Choppers**Duration: 8 Periods (L: 6 – T: 2)**

Single phase half wave and full wave AC voltage regulator with R load - Applications of AC voltage regulators - Choppers- Classification of Choppers, Four quadrant operation of a chopper, different voltage control modes of operation, Applications of choppers.

UNIT 4 – Inverters & Cyclo-converters**Duration: 12 Periods (L: 9 –T: 3)**

Classification of Inverters-basic series Inverter- parallel Inverter- single phase bridge Inverter – applications of inverters -Cyclo-converter – basic principle of operation- single-phase center tapped Cyclo-converter- applications of Cyclo-converters.

UNIT 5 - Speed Control of DC and AC Motors**Duration: 8 Periods (L: 6 –T: 2)**

Advantages of power electronic drives - DC Motor control - Speed control of DC shunt Motor and DC Series motor by using single phase converters and choppers-Compare chopper controlled drives and converter controlled drives - AC Motor Controls- speed control of 3 phase induction Motor by using AC voltage controllers.

UNIT 6 - Applications of Power Electronic Circuits**Duration: 12 Periods (L: 9 –T: 3)**

Applications of power electronic circuits- Types of disturbances in commercial power supply - devices to suppress spikes in supply voltages – SMPS - On line and Off line UPS – advantages - applications – estimation of UPS rating and battery rating for a given load and backup time - Light dimmer Circuit- Burglar alarm Circuit- Emergency lamp Circuit using SCR—power control circuits using SCR – Protecting power devices.

Recommended Books

1. Power Electronics– Jameel Asghar PHI, New Delhi.
2. Electronics In Industry – George M. Chute & Robert D. Chute
3. Industrial Electronics – G.K. Mithal
4. Power Electronics - P.C. Sen.
5. Industrial Electronics – M.S. Berde
6. Industrial & Power Electronics- Harish Rai.
7. Industrial Electronics and Control - S.K. Bhattacharya & S. Chatterjee
8. Article by R.K. Sugandhi & K.K. Sugandhi - Thyristor (theory & applications)
9. Power electronics by M.D. Singh & K.B. Kanchandani

Suggested E-Learning references

1. <http://electrical4u.com/>
2. www.nptel.ac.in
3. <https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/>
4. <http://www.eng.uwi.tt/depts/elec/staff/rdefour/ee33d/index.html>

Suggested Learning Outcomes

After completion of the subject, the student shall be able to

- 1.1 List different devices of thyristor family.
 - 1.2 Draw the ISI circuit symbols for each device in thyristor family.
 - 1.3 Explain the constructional details of SCR
 - 1.4 Explain the two transistor analogy of SCR.
 - 1.5 Explain the static Volt – Ampere characteristics of SCR with the help of a diagram.
 - 1.6 Draw the Gate characteristics of SCR
 - 1.7 Explain SCR triggering by UJT.
 - 1.8 Mention the ratings of SCR.
 - 1.9 Give the advantages of SCR as a switch.
 - 1.10 Explain the construction of GTO SCR and its static VI characteristics with the help of diagram.
 - 1.11 Compare GTO SCR and SCR.
 - 1.12 Explain the static Volt-ampere characteristics of DIAC with the help of diagram.
 - 1.13 Explain the static Volt-ampere characteristics of TRIAC with the help of diagram.
 - 1.14 Explain the working of Insulated gate Bipolar transistor (IGBT) by giving their static V-I characteristics.
 - 1.15 State the necessity of Commutation in SCR's
 - 1.16 Explain various methods of Commutation methods for SCR.
 - 1.17 List applications of SCR, GTO SCR, DIAC, TRIAC, IGBT, LASCR
-
- 2.1. Classify converters.
 - 2.2. List the advantages and disadvantages of Power Electronic converters
 - 2.3. Explain the working of single-phase half wave controlled converter with Resistive load..
 - 2.4. Explain the working of single-phase half wave controlled converter with R-L load.
 - 2.5. State the need of freewheeling diode
 - 2.6. Explain the working of single-phase half wave controlled converter with R-L loads and freewheeling diode
 - 2.7. Explain the working of single phase full wave fully controlled converter with resistive load.
 - 2.8. Explain the working of single phase full wave fully controlled converter with R- L load.
 - 2.9. Explain the working of three-phase half wave controlled converter with Resistive load

2.10. List the applications of Power Electronic converters

- 3.1 Define AC voltage regulator.
- 3.2 Explain the working of single phase half wave AC voltage regulator.
- 3.3 Explain the working of single phase full wave AC voltage regulator.
- 3.4 List the applications of AC voltage regulators.
- 3.5 Define Chopper.
- 3.6 Classify choppers.
- 3.7 Explain the working principle of chopper.
- 3.8 Describe the voltage control modes of chopper
- 3.9 Explain the working of step-down chopper.
- 3.10 Explain the operation of chopper in all four quadrants.
- 3.11 List the applications of choppers.

- 4.1 Define inverter.
- 4.2 Classify inverters.
- 4.3 Explain the working of series inverter.
- 4.4 Explain the working of parallel inverter
- 4.5 Explain the working of single-phase bridge inverter with R load.
- 4.6 List the applications of inverter.
- 4.7 Define Cyclo-converter.
- 4.8 Explain the basic principle of Cyclo-converter.
- 4.9 Explain the working of single-phase centre tapped Cyclo-converter.
- 4.10 List the applications of Cyclo-converter.

- 5.1 List the advantages of power electronic drives.
- 5.2 List the dis-advantages of power electronic drives.
- 5.3 Mention the factors affecting the speed of DC Motors.
- 5.4 Explain the speed control for DC Shunt motor using single phase converters.
- 5.5 Explain the speed control for DC Series motor using single phase converters
- 5.6 Explain the speed control for DC Shunt motor and using chopper.
- 5.7 Explain the speed control for DC Series motor using chopper.
- 5.8 Compare chopper controlled drives and converter controlled drives
- 5.9 List the factors affecting speed of the AC Motors.
- 5.10 Explain the speed control of Induction Motor by using AC voltage controller.

- 6.1 List any six applications of power electronic circuits.
- 6.2 List the types of disturbances in commercial power supply.
- 6.3 List the devices used to suppress spikes in supply voltages.
- 6.4 Classify UPS
- 6.5 Draw and explain the block diagram of off-line UPS.
- 6.6 Draw and explain the block diagram of on-line UPS.
- 6.7 List the storage batteries used in UPS.
- 6.8 List the advantages of on-line and off-line UPS
- 6.9 List the applications of on-line and off-line UPS
- 6.10 Estimate the UPS rating and battery rating for a given load and backup time
- 6.11 Explain SMPS with block diagram.
- 6.12 List the advantages of SMPS.
- 6.13 Explain the Light dimmer circuit using DIAC/TRIAC with the help of a diagram.

- 6.14 Explain the power control circuits using SCRs.
- 6.15 Explain the mechanism of protecting power devices – overvoltage protection – crowbar circuit – Circuit breakers using SCRs.
- 6.16 Explain the Burglar alarm circuit using SCR with the help of a diagram.
- 6.17 Explain the Emergency lamp circuit using SCR with the help of a diagram.

Suggested Student Activities

1. Student visits Library to refer to Electrical Manuals and IEEE papers on related topic
2. Student visits the Lab to experiment with converters, inverters and view the models of different applications of Power Electronics circuits
3. Visit nearby Industry to familiarize with applications of different power electronic circuits & drives
4. Quiz
5. Group discussion
6. Surprise test

CO-PO Mapping Matrix

	Basic knowledge	Discipline Knowledge	Experiments and practice	Engineering Tools	Engineer and society	Environment & sustainability	Ethics	Individual and Team work	Communication	Lifelong learning	Linked PO
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	
CO1	3	2								2	1,2,10
CO2		2		2						2	2,4,10
CO3		2		2						2	2,4,10
CO4		2		2						2	2,4,10
CO5		2		2	2					2	2,4,5,10
CO6		2		2	2					2	2,4,5,10

Internal Evaluation

Test	Units	Marks
Mid Sem 1	1 and 2	20
Mid Sem 2	3 and 4	20
Slip Test 1	1 and 2	5
Slip Test 2	3 and 4	5
Assignments	-	5
Seminars	-	5
	Total	60

QUESTION PAPER PATTERN FOR MID SEMESTER EXAMS

Sl.No	Description	Level	No of Questions	Marks for each question	Choice	Total Marks
01	Part-A	Remembering(R)	4	1	Nil	4 Marks
02	Part-B	Understanding(U)	4	3	2	6 Marks
03	Part-C	Application(A)	4	5	2	10 Marks
Total Marks						20 Marks

MID SEM-I EXAM

S.No	Unit No	R	U	A
1	Unit-I	1,2	5(a)	7(a)
			5(b)	7(b)
2	Unit-II	3,4	6(a)	8(a)
			6(b)	8(b)
Total Questions		4	4	4

MID SEM-II EXAM

S.No	Unit No	R	U	A
1	Unit-III	1,2	5(a)	7(a)
			5(b)	7(b)
2	Unit-IV	3,4	6(a)	8(a)
			6(b)	8(b)
Total Questions		4	4	4

The length of answer for each question framed in respect of Part-A, B&C shall not exceed $\frac{1}{4}$ of a page side, 1 page side and 2page sides respectively

QUESTION PAPER PATTERN FOR SEMESTER END EXAM

Sl.No	Description	Level	No of Questions	Marks for each question	Choice	Total Marks
01	Part-A	Remembering(R)	8	1	Nil	8 Marks
02	Part-B	Understanding(U)	8	3	4	12 Marks
03	Part-C	Application(A)	8	5	4	20 Marks
Total Marks						40 Marks

Unit No	Questions to be set for SEE				
	R		U		A
I	Q4	Q1		Q9(a)	Q13(a)
II					
III		Q2		Q10(a)	Q14(a)
IV					
V		Q3	Q5,Q6	Q9(b), Q11(a),	Q13(b), Q15(a),
VI				Q11(b)	Q15(b)
		Q7,Q8	Q10(b), Q12(a),	Q14(b), Q16(a),	
			Q12(b)	Q16(b)	
Total Questions	8		8		8

18EE-503E(B)

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TELANGANA
DIPLOMA IN ELECTRICAL & ELECTRONICS ENGG.
SUB CODE: 18EE-503E(B)
POWER ELECTRONICS
MID SEM -I MODEL PAPER

TIME: 1 HOUR

TOTAL MARKS: 20

PART – A

Marks: 4Q X 1 = 4

Instructions: (1) Answer all questions
(2) Each question carries **one** mark.

1. List different devices of thyristor family
2. Draw the ISI symbols for a) SCR, b) GTO SCR
3. Classify converters in any two aspects.
4. What is the need of freewheeling diode in converter

PART - B

Marks: 2Q x 3 = 6

Instructions: (1) Answer **all** questions.
(2) Each question carries **three** marks.

5.(a) Define latching current and holding current of SCR.

OR

5.(b) Draw the static Volt-ampere characteristics of DIAC with the help of a diagram.

6.(a) Draw the input and output waveforms of single-phase half wave controlled converter with resistive load.

OR

6. (b) Write the advantages of Power Electronic converters

PART - C

Marks: 2Q x 5 = 10

Instructions: (1) Answer **all** questions.
(2) Each question carries **five** marks.

7.(a). Explain the two-transistor analogy of SCR with equivalent circuit.

OR

7.(b). Explain the static Volt-ampere characteristics of TRIAC with the help of a diagram.

8.(a). Explain the working of single phase full wave bridge converter with R- L load.

OR

8.(b). Explain the working of three-phase half wave controlled converter with Resistive load

18EE-503E(B)

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TELANGANA
DIPLOMA IN ELECTRICAL & ELECTRONICS ENGG.
SUB CODE: 18EE-503E(B)
POWER ELECTRONICS
MID SEM –II MODEL PAPER

TIME: 1 HOUR

TOTAL MARKS: 20

PART – A

Marks: 4Q X 1 = 4

Instructions: (1) Answer all questions
(2) Each question carries **one** mark.

1. Give the classification of choppers.
2. List any two applications of AC voltage regulators.
3. Classify inverters in any one aspect.
4. List any two applications of Cyclo-converters.

PART - B

Marks: 2Q x 3 = 6

Instructions: (1) Answer all questions.
(2) Each question carries **three** marks.

- 5.(a). Explain the working of single phase half wave AC voltage regulators.

OR

- 5.(b). Explain the working principle of chopper.

- 6.(a). Draw the input and output waveforms of series inverter.

OR

- 6.(b). Draw the circuit of parallel inverter

PART - C

Marks: 2Q x 5 = 10

Instructions: (1) Answer **all** questions.
(2) Each question carries **five** marks.

- 7.(a). Explain the working of single phase full wave AC voltage regulator.

OR

- 7.(b). Describe the voltage control modes of chopper

- 8.(a). Explain the working of single-phase bridge inverter with R load.

OR

- 8.(b). Explain the basic principle of Cyclo-converter

18EE-503E(B)

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TELANGANA
DIPLOMA IN ELECTRICAL & ELECTRONICS ENGG.
SUB CODE: 18EE-503E(B)
POWER ELECTRONICS
SEMESTER END EXAM MODEL PAPER

TIME: 2 HOURS

TOTAL MARKS: 40

PART – A

Marks : 8Q X 1= 8

Instructions: (1) Answer all questions
(2) Each question carries **one** mark.

1. Draw the ISI symbols for a) TRIAC, b) LASCR
2. Define AC regulator
3. List any two applications of choppers.
4. Classify inverters based on any one aspects.
5. Draw the circuit of single phase full converter.
6. Write any two speed control methods of DC motor.
7. List any two types of UPS.
8. List any two advantages of SMPS.

PART - B

Marks: 4Q×3=12

Instructions: (1) Answer all questions.
(2) Each question carries **three** marks.

- 9.(a). Draw the Gate characteristics of SCR.
OR
- 9.(b). List the factors affecting speed of the AC Motors.
- 10.(a). List the applications of AC voltage regulators
OR
- 10.(b). List any six applications of power electronic circuits
- 11.(a). List the advantages of power electronic drives.
OR
- 11.(b). Compare chopper controlled drives and converter controlled drives in any three aspects.
- 12.(a). List the types of disturbances in commercial power supply.
OR
- 12.(b). List the advantages of online UPS.

PART – C

Marks: 4Q × 5= 20

Instructions: (1) Answer all questions.
(2) Each question carries **five** marks.

13.(a). Explain the static Volt-ampere characteristics of DIAC with the help of a diagram.

OR

13.(b). Explain the speed control of Induction Motor by using AC voltage controller.

14.(a). Explain the operation of chopper in all four quadrants.

OR

14.(b). Draw the block diagram of an off-line UPS.

15.(a). Explain the speed control for DC Series motor using chopper.

OR

15.(b). Explain the speed control of Induction Motor by using AC voltage controller.

16.(a). Explain the Burglar alarm circuit using SCR with the help of a diagram.

OR

16.(b). Explain the power control circuit using SCR.

SWITCHGEAR AND PROTECTION

Course Title	: Switchgear and Protection	Course Code	: 18EE-504E(A)
Semester	: V	Course Group	: Elective
Teaching Scheme in	: 45:15:0	Credits	: 3
Periods (L:T:P)		Total Contact Periods	: 60
Methodology	: Lecture + Tutorial	SEE	: 40 Marks
CIE	: 60 Marks	(Semester End Examination)	
(Continuous Internal Evaluation)			

Pre requisites

This course requires the basic knowledge of mathematics and science.

This course requires the knowledge of AC Machines, Transmission lines

Course Outcomes

CO1 :	Classify Switchgear and Fuses
CO2 :	Describe the function of High Voltage Circuit Breakers and Evaluate the Short Circuit KVA
CO3 :	Classify Protective Relays
CO4 :	Describe the Schemes of Protection for Alternators and Transformers
CO5 :	Explain Protection Schemes for Transmission Lines and Feeders
CO6 :	Explain the importance of Lightning Arrestors and necessity of Neutral Earthing

Blue Print of Marks for SEE

Unit No	Unit Name	Periods	Questions to be set for SEE			
			R		U	A
1	Switches & Fuses	06	Q4	Q1	Q9(a)	Q13(a)
2	Circuit Breakers & Reactors	14				
3	Protective Relaying	10		Q2	Q10(a)	Q14(a)
4	Protection of Alternators and Transformers	10				
5	Protection of Transmission Lines and Feeders	10		Q3	Q9(b), Q11(a), Q11(b)	Q13(b), Q15(a), Q15(b)
6	Lighting Arrestors and Neutral Grounding	10				
Total		60	8		8	8

Course Content

UNIT 1 -Switches & Fuses

Duration: 6 Periods (L: 4.5 – T: 1.5)

Switch gear– Isolators, Load break switch, Air break switches, Earth Switches – Fuse - Types of fuses based on rated current - Fusing current, Fusing factor, cut-off characteristics –time current characteristics-HRC fuse-Liquid power fuse-application of fuses

UNIT 2 – Circuit Breakers & Reactors

Duration: 14 Periods (L: 10.5– T: 3.5)

Circuit breakers - phenomenon of arc - arc voltage, arc current –Arc quenching- Circuit breakers classification based on the medium of arc quenching– Working of O.C.B, A.B. C.B, SF6 C.B & VCB and their comparisons.

Reactors –their necessity - Types of reactors– Equation for short circuit KVA .

UNIT 3 – Protective Relaying

Duration: 10 Periods (L: 7.5 – T: 2.5)

Relay Requirements - Features of relays – Classifications based on principle of operation and time of operation –solenoid plunger type-attracted armature relays - Construction and working of induction type over current relays – Directional Over current relay-Numerical over current relay- Impedance distance relay.

UNIT 4 – Protection of Alternators and Transformers

Duration: 10 Periods (L: 7.5 – T: 2.5)

Protection of Alternators Schemes - Probable faults- Differential protection - Earth fault protection – Split phase protection - Field suppression protection - Protection of Transformer - Possible faults in the transformer – Precautions required for protection – Differential protections - Protection against excessive heating of transformer oil - Buchholz relay.

UNIT 5 - Protection of Transmission Lines and Feeders

Duration: 10 Periods (L: 7.5 – T: 2.5)

Transmission line and feeder protection- Pilot wires - Distance and impedance relays in Transmission lines - Combined protection using definite distance and time distance relays – Protection of radial feeders, parallel feeders, and ring main feeders- Bus bar protection.

UNIT 6: Lighting Arrestors and Neutral Grounding

Duration: 10 Periods (L: 7.5 – T: 2.5)

Surge Protection- Need for Surge Protection -Surge types and causes of surges – Scheme of surge protection with diagram - Various types of LA's –Rod gap, Horn gap, expulsion type, valve type, metal oxide, - Neutral grounding and its Methods.

Recommended Books

1. Principle of Power systems - V.K. Mehta
2. Electrical power systems - S.L. Uppal
3. Text book of Electrical power systems - SONY, Gupta Bhatnagar
4. Electrical power systems- JB Gupta
5. Electrical power Systems - CL Wadhwa
6. Switch gear and Protection by Sunil S. Rao
7. Power System Protection And Switchgear by Buvanesh A Oza, Nirmalkumar C Nair, Rases P Mehta and Vijay H Makwana, McGraw HILL Education(India Pvt. Ltd) Newdelhi
8. J.B.Gupta “Switchgear & Protection”, (edition), Katson Publisher,2008
9. MadhavaRao T.S., 'Power System Protection - Static Relays', McGraw Hill, New Delhi,2nd Edition, 21st reprinted, 2008.
10. Handbook of Switchgears by BHEL
11. Testing , commissioning , operation and maintenance of electrical equipment by Sunil S Rao ,Khanna Publications

Suggested E-Learning references

1. electrical4u.com
2. www.nptel.ac.in
3. <https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/>
4. <http://www.pdfdocuments.com/testing-commissioning-operation-maintenanceelectrical-equipments.pdf>
5. youtube videos on circuit breakers
6. youtube videos on protective relays
7. nptel videos on switchgear protection

Suggested Learning Outcomes

- 1.1 State the types of faults in power system and their effects.
 - 1.2 Define switch gear.
 - 1.3 Classify switch gear with respect to voltage level
 - 1.4 State the purpose of isolators, load break switches, air break switches and earth switches
 - 1.5 List the uses and limitations of different types of switches.
 - 1.6 Explain fuse as protective device.
 - 1.7 Define the following
 - i) Rated current
 - ii) Fusing current
 - iii) Fusing factor
 - 1.8 Draw and explain cut-off characteristics of fuse
 - 1.9 Draw and explain Time-current characteristics of a fuse
 - 1.10 List types of fuses
 - 1.11 Explain the working principle of HRC fuse
 - 1.12 Explain the working principle of Liquid power fuse
-
- 2.1 Explain the phenomenon of arc, arc voltage, arc current.
 - 2.2 State factors responsible for arc formation.
 - 2.3 Describe the methods of arc quenching.
 - 2.4 Classify the circuit breakers based upon medium of arc quenching.
 - 2.5 Describe with neat diagram the working of oil circuit breaker(OCB).
 - 2.6 Explain with a legible sketch the principle of working of Air blast circuit breaker.
 - 2.7 Explain with a legible sketch the principle of working of SF₆ circuit breaker.

- 2.8 Explain with a legible sketch the principle of working of Vacuum circuit breaker.
- 2.9 State the importance of current limiting reactors in power systems.
- 2.10 List the types of reactors.
- 2.11 Describe the construction of the different types of reactors.
- 2.12 Draw the schematic diagram of reactor connections.
- 2.13 State the importance of short circuit KVA.
- 2.14 Solve simple problems on short circuit KVA

3.1 State the basic requirements of relays

3.2 State the important features of relays.

3.3 Classify the relays based upon

i) Principle of Operation ii) Time of operation.

3.4 Describe the working of solenoid plunger type relay

3.5 Describe the working of attracted armature relays.

3.6 List the uses of attracted armature relays.

3.7 Describe the construction and working of induction type over current relay.

3.8 Define the current setting, time setting of relays.

3.9 Explain the principle of obtaining directional property in induction relays.

3.10 Describe the working of directional over current induction relay.

3.11 List the applications of directional over current induction relay.

3.12 Explain with block diagram the working of numerical over current relay

3.13 Explain the principle of working of impedance relay.

3.14 List the applications of impedance relay.

3.15 Describe the current differential protection.

3.16 Describe the voltage differential protection

4.1 List the probable faults in Alternator Stator and rotor.

4.2 State the effects of faults on Alternator Stator and rotor.

4.3 Describe the scheme of protection against excessive heating of stator and rotor.

4.4 Explain the differential protection for alternator stator.

4.5 Explain the earth fault protection for rotor.

4.6 Explain the split phase protection of alternator against inter turn short circuits.

4.7 Explain the need and working of field suppression protection.

4.8 List the possible faults in a transformer and mention their effects.

4.9 List the precautions to be taken for applying differential protection to transformers.

4.10 Explain differential protection of transformer.

4.11 Explain the working of Buchholz relay.

5.1 Explain the different schemes of protection for single and duplicate bus bars.

5.2 Describe the transmission line and feeder protection.

5.3 Explain pilot wires and their effects.

5.4 Explain the protection of transmission lines using impedance relays.

5.5 Explain combined protection of transmission line using definite distance and time distance relays

5.6 Explain protection of radial feeders using time graded relays.

5.7 Explain protection of parallel feeders using directional relays.

5.8 Explain protection of ring main feeder using directional relays.

5.9 Explain differential protection for parallel feeders of transmission lines.

6.1 Define surge.

6.2 List the types of surges

6.3 Give reasons for the cause of surges.

6.4 Explain the working principle of Lightning arrester with diagram.

6.5 List the six types of lightning arrestors for outdoor applications

6.6 Describe the construction and working of following types of lightning arrestors.

i) Rod gap ii) Horn gap iii) Expulsion type iv) valve type v) Metal oxide

6.7 List the applications of above lightning arrestors.

6.8 Explain the necessity of neutral grounding .

6.9 Give the merits and demerits of neutral grounding.

6.10 Describe the following methods of neutral grounding

i) Solid grounding ii) Resistance grounding iii) Reactance grounding iv) Voltage transformer grounding v) Zig-zag transformer grounding .

6.11 Compare the different methods of neutral grounding

Suggested Student Activities

1. Student visits Library to refer to Switchgear and Protection subject related books
2. Visit nearby substation and prepare a report
3. Quiz
4. Group discussion
5. Surprise test
6. Register for MOOCS courses

CO-PO Mapping Matrix

[illegible]

Internal Evaluation

Test	Units	Marks
Mid Sem 1	1 and 2	20
Mid Sem 2	3 and 4	20
Slip Test 1	1 and 2	5
Slip Test 2	3 and 4	5
Assignments	-	5
Seminars	-	5
	Total	60

QUESTION PAPER PATTERN FOR MID SEMESTER EXAMS

Sl.No	Description	Level	No of Questions	Marks for each question	Choice	Total Marks
01	Part-A	Remembering(R)	4	1	Nil	4 Marks
02	Part-B	Understanding(U)	4	3	2	6 Marks
03	Part-C	Application(A)	4	5	2	10 Marks
Total Marks						20 Marks

MID SEM-I EXAM

S.No	Unit No	R	U	A
1	Unit-I	1,2	5(a)	7(a)
			5(b)	7(b)
2	Unit-II	3,4	6(a)	8(a)
			6(b)	8(b)
Total Questions		4	4	4

MID SEM-II EXAM

S.No	Unit No	R	U	A
1	Unit-III	1,2	5(a)	7(a)
			5(b)	7(b)
2	Unit-IV	3,4	6(a)	8(a)
			6(b)	8(b)
Total Questions		4	4	4

The length of answer for each question framed in respect of Part-A, B&C shall not exceed $\frac{1}{4}$ of a page side, 1 page side and 2page sides respectively

QUESTION PAPER PATTERN FOR SEMESTER END EXAM

Sl.No	Description	Level	No of Questions	Marks for each question	Choice	Total Marks
01	Part-A	Remembering(R)	8	1	Nil	8 Marks
02	Part-B	Understanding(U)	8	3	4	12 Marks
03	Part-C	Application(A)	8	5	4	20 Marks
Total Marks						40 Marks

Unit No	Questions to be set for SEE				
	R		U		A
I	Q4	Q1		Q9(a)	Q13(a)
II					
III		Q2		Q10(a)	Q14(a)
IV					
V		Q3	Q5,Q6	Q9(b), Q11(a), Q11(b)	Q13(b), Q15(a), Q15(b)
VI					
Total Questions	8		8	8	

STATE BOARD OF TECHNICAL EDUCATION & TRAINING , TELANGANA
DIPLOMA IN ELECTRICAL & ELECTRONICS ENGG.
SUB CODE: 18EE-504E (A)
SWITCHGEAR AND PROTECTION
MID SEM -I MODEL PAPER

TIME: 1 HOUR

TOTAL MARKS: 20

Important Note: Wherever any question has choice, marks will be allotted only to first attempted question. **No marks will be allotted for extra questions answered**

PART – A

Marks: 4Q X 1= 04

- Instructions:** (1) Answer all questions
(2) Each question carries **One** mark.
1. Define switchgear.
 2. State the use of an isolator.
 3. Define Arc.
 4. State the use of a Reactor.

PART - B

Marks: 2Q x 3 = 06

- Instructions:** (1) Answer all questions
(2) Each question carries **Three** marks.
- 5(a) List the types of fuses .
or
5(b) Write the differences between isolator and earth switch
6(a) Classify circuit breakers based on arc quenching medium
Or
6(b) Mention any three advantages of SF₆ circuit breakers

PART - C

Marks: 2Q x 5= 10

- Instructions:** (1) Answer all questions
(2) Each question carries **Five** marks.
- 7(a) Explain the purpose of Isolators, Air break switches and Earth switches
or
7(b) Explain operation of HRC fuse with diagram.
8(a) An Vacuum circuit breaker is used on the HV side of the transformer in a substation .
Explain why it is preferred over air blast circuit breaker.
Or
8(b) Draw the schematic diagram of reactor connections.

STATE BOARD OF TECHNICAL EDUCATION & TRAINING , TELANGANA
DIPLOMA IN ELECTRICAL & ELECTRONICS ENGG.
SUB CODE: 18EE-504E (A)
SWITCHGEAR AND PROTECTION

MID SEM -II MODEL PAPER

TIME: 1 HOUR

TOTAL MARKS: 20

PART – A

Marks: 4Q X 1= 04

Instructions: (1) Answer all questions
(2) Each question carries **One** mark.

1. Define Over Current Relay.
2. Define PSM.
3. List the protection schemes of Alternator.
4. List the possible faults in a transformer.

PART - B

Marks: 2Q x 3 = 06

Instructions: (1) Answer all questions.
(2) Each question carries Three marks.

- 5(a) State the basic requirements of relays
or
- 5(b) List the applications of impedance relay
- 6(a) State the effects of faults on Alternator Stator
or
- 6(b) Describe the current differential protection of transformer

PART - C

Marks: 2Q x 5= 10

Instructions: (1) Answer all questions
(2) Each question carries **Five** marks.

- 7(a) Describe the working of induction type over current relay
or
- 7(b) Explain the working of Buchholz relay
- 8(a) Explain the working of field suppression protection of alternator
or
- 8(b) Describe the working of solenoid plunger type relay

18EE-504E (A)

STATE BOARD OF TECHNICAL EDUCATION & TRAINING , TELANGANA
DIPLOMA IN ELECTRICAL & ELECTRONICS ENGG.
SUB CODE: 18EE-504E (A)
SWITCHGEAR AND PROTECTION

SEMESTER END EXAM MODEL PAPER

TIME: 2 HOURS

TOTAL MARKS: 40

PART – A

Marks: 8Q X 1= 8

Instructions: (1) Answer all questions
(2) Each question carries **one** mark.

1. Distinguish between a fuse and a switch.
2. List the methods of arc quenching.
3. State the basic requirements of a relay.
4. List any four methods of Neutral grounding.
5. Mention the probable faults in alternator.
6. State the use of pilot wires in protection.
7. Draw the protection scheme for single bus bar arrangement.
8. Define surge.

PART - B

Marks: 4Qx3=12

Instructions: (1) Answer any Four Questions
(2) Each question carries Three marks.

- 9(a) State the use of Air break Switch.
Or
9(b) State the uses of Distance Relay
- 10(a) Describe the arcing phenomenon.
Or
10(b) State the need for Surge Protection
- 11(a) State the types of Feeders
Or
11(b) Draw the protection scheme of radial feeders using time graded relays.
- 12(a) State the causes of surges
Or
12(b) Write the necessity of neutral earthing

PART - C

Marks: 4Qx5=20

Instructions: (1) Answer any Four Questions
(2) Each question carries Five marks

- 13(a) Explain the working of oil circuit breaker with a neat sketch.
Or
13(b) Explain protection of parallel feeders using directional relays.
- 14(a) Explain earth fault protection for stator of an alternator.
Or
14(b) Explain with a neat figure the working of Valve type Lightning Arrestor.
- 15(a) Explain the protection of transmission lines by definite distance relay.

Or

15(b) Explain protection of ring main feeder using directional relays.

16a) Explain reactance grounding

Or

16(b) Explain the working principle of expulsion type lightning arrestor with diagram.

ADVANCED PROTECTION OF POWER SYSTEMS

Course Title	: Advanced Protection of Power Systems	Course Code	: 18EE-504E(B)
Semester	: V	Course Group	: Elective
Teaching Scheme in Periods (L:T:P)	: 45:15:0	Credits	: 3
Methodology	: Lecture + Tutorial	Total Contact Periods	: 60
CIE (Continuous Internal Evaluation)	: 60 Marks	SEE (Semester End Examination)	: 40 Marks

Pre requisites

This course requires the basic knowledge of mathematics and science.

This course requires the knowledge of AC Machines, Transmission lines

Course Outcomes

CO1 :	Classify High Voltage Circuit Breaker
CO2 :	Classify Protective Relays.
CO3 :	State the principles of static relays.
CO4 :	Describe the protection schemes of alternator and transformers
CO5 :	Explain the protection schemes for transmission lines and feeders
CO6 :	Describe digital relay

Blue Print of Marks for SEE

Unit No	Unit Name	Periods	Questions to be set for SEE				
			R		U	A	
1	Principles of switchgear and circuit breakers	10	Q4	Q1		Q9(a)	Q13(a)
2	Protective Relaying	10					
3	Static relays	08		Q2		Q10(a)	Q14(a)
4	Protection of Alternators and transformers	12					
5	Protection of Transmission Lines and Feeders	08		Q3	Q5,Q6	Q9(b), Q11(a), Q11(b)	Q14(b), Q15(a), Q15(b)
6	Basic Elements of Digital Protection	12					
Total		60	8		8	8	

Course Content

UNIT 1 -Principles of switchgear and circuit breakers

Duration: 10 Periods (L:7.5– T:2.5)

Switch gear – Isolators, Load break, air break&earthing switches - phenomenon of arc - arc voltage -arc current – arc quenching - Circuit breakers and their classification based on the medium of arc quenching – Working of O.C.B, A.B.C.B, SF₆C.B & VCB - their comparisons.

UNIT 2 – Protective Relaying

Duration: 10 Periods (L:7.5– T:2.5)

Requirements of relays – Classification of Relays –solenoid plunger type - attracted armature relays- merits and demerits - Construction and working of induction type over current relays – Directional Over current relay - Impedance relay.

UNIT 3 – Static relays**Duration: 08 Periods (L: 6 – T: 2)**

Comparators and static relay characteristics - Relays as comparators –Amplitude and Phase comparison schemes–General equation for comparators for different types of relays –Static comparators–Coincidence circuits–Phase splitting methods–Hall effect comparators –Operating principles –Use of level detectors – Time delay circuits –Filters

UNIT 4 - Protection of Alternators and transformers**Duration: 12 Periods (L: 9– T: 3)**

Protection of Alternators - Scheme of protection - probable faults in alternators - Differential protection - Earth fault protection for stator and rotor – Split phase protection - Field suppression protection - Protection of Transformer - Possible faults in the transformer – Precautions required for protection – Differential protections and Buchholz relay

UNIT 5 - Protection of Transmission Lines and Feeders**Duration: 8 Periods (L: 6 – T: 2)**

Transmission line and feeder protection- Pilot wires, protection of transmission lines - Combined protection using definite distance and time distance relays – Protection of radial feeders, parallel feeders, and ring main feeders - Bus bar protection-Single bus bar, duplicate bus bars-surges-lightning arresters-applications of lightning arresters

UNIT 6: Basic Elements of Digital Protection**Duration: 12 Periods (L:9-T:3)**

Application of Numerical relays for Interconnected power system – networks - Basic Components of a Digital Relay - Signal Conditioning – Subsystems – Transducers - Surge Protection Circuits - Analog Filtering - Analog Multiplexers - Conversion Subsystem - Signal Aliasing Error - Sample and Hold Circuit - Digital Multiplexing - Digital-to-Analog Conversion -Analog-to-Digital Conversion -Digital Relay Subsystem - Benefits of digital relays-numerical relay applications

Recommended Books

1. Principle of Power systems - V.K. Mehta
2. Electrical power systems - S.L. Uppal
3. Text book of Electrical power systems - Sony GuptaBhatnagar
4. Electrical power systems- JB Gupta
5. Electrical power Systems - CL Wadhwa
6. Switch gear and Protection by Sunil S. Rao

Suggested E-Learning references

1. electrical4u.com
2. www.nptel.ac.in
3. <https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/>

Suggested Learning Outcomes

- 1.1 State the types of faults in power system and their effects.
 - 1.2 Define switch gear.
 - 1.3 Classify switch gear with respect to voltage level
 - 1.4 State the purpose of isolators, load break switches, air break switches and earthing switches
 - 1.5 Explain the phenomenon of arc, arc voltage, arc current and its effects.
 - 1.6 State factors responsible for arc formation.
 - 1.7 Describe the methods of arc quenching.
 - 1.8 Classify the circuit breakers based upon medium of arc quenching.
 - 1.9 State the principle of oil circuit breaker
 - 1.10 Explain with legible sketch the working principle of Air blast circuit breaker
 - 1.11 Explain with legible sketch working principle of SF₆ circuit breaker
 - 1.12 Explain with legible sketch working principle of vacuum circuit breaker
-
- 2.1 State the basic requirements of relays
 - 2.2 State the important features of relays.
 - 2.3 Classify the relays based upon
 - i) Principle of Operation
 - ii) Time of operation.
 - 2.4 Describe the working of solenoid plunger type relay
 - 2.5 Describe the working of attracted armature relays.
 - 2.6 List the uses of attracted armature relays.
 - 2.7 Describe the construction and working of induction type over current relay.
 - 2.8 Describe the current setting, time setting and application of above relays.
 - 2.9 Explain the principle of obtaining directional property in induction relays.
 - 2.10 Describe the working of directional over current induction relay.
 - 2.11 List the applications of directional over current induction relay.

2.12 Explain the principle of working of definite time distance impedance relay.

2.13 List the applications of impedance relay.

2.14 Describe the current differential protection.

2.15 Describe the voltage differential protection

3.1 State the advantages of static relays over electromagnetic relays

3.2 Explain with block diagram the construction of static protective relays

3.3 Describe how relays are used as comparators

3.4 Mention the types of amplitude comparators

3.5 Explain with a legible sketch the circulating current type integrating comparator

3.6 List the static phase comparators

3.7 Explain coincidence type phase comparators

3.8 Explain Hall Effect type of phase comparators

3.9 State the purpose of level detector in static relaying

3.10 State the need for time delay circuit in static relaying

4.1 State the probable faults in Alternator Stator and rotor.

4.2 State the effects of faults on Alternator Stator and rotor.

4.3 Describe the scheme of protection against excessive heating of stator and rotor.

4.4 Explain the differential protection for alternator stator.

4.5 Explain the earth fault protection for rotor.

4.6 Explain the split phase protection of alternator against inter turn short circuits.

4.7 Explain the need and working of field suppression protection.

4.8 List the possible faults in a transformer and mention their effects.

4.9 List the precautions to be taken for applying differential protection to transformers.

4.10 Explain differential protection of transformer.

4.11 Explain the working of Buchholz relay and its protection scheme for transformer.

5.1 Explain the different schemes of protection for single and duplicate bus bars.

5.2 Describe the transmission line and feeder protection.

5.3 Explain pilot wires and their effects.

5.4 Describe the protection of transmission lines using distance and impedance relays.

5.5 Explain the combined protection by using definite distance and time distance relays.

5.6 Describe about protection of radial feeders using time graded relays.

- 5.7 Explain protection of parallel feeders using directional relays.
 - 5.8 Explain protection of ring main feeder using directional relays.
 - 5.9 Explain differential protection for parallel feeders of transmission lines.
 - 5.10 Define surge
 - 5.11 List the types of surges
 - 5.12 Give reasons for the causes of surges
 - 5.13 Explain the working principle of Lightning arrester with diagram.
 - 5.14 List the types of lightning arrestors for outdoor applications
 - 5.15 Describe the construction and working of following types of lightning arrestors.
 - i) Rod gap ii) Horn gap iii) Expulsion type iv) valve type v) Metal oxide
 - 5.16 List the applications of above lightning arrestors.
-
- 6.1 Explain with block diagram the working of digital relay
 - 6.2 State the advantages of digital relay
 - 6.3 State the limitations of digital relay
 - 6.4 State the purpose of sample and hold circuit
 - 6.5 Explain with block diagram the working of numerical over current relay
 - 6.6 Explain with block diagram the working of transformer numerical differential relay
 - 6.7 Mention the applications of numerical relays for interconnected power system

Suggested Student Activities

1. Student visits Library to refer to Electrical Manuals
2. Visit nearby substation and prepare a report
3. Quiz
4. Group discussion
5. Surprise test

CO-PO Mapping Matrix

	Basic knowledge	Discipline Knowledge	Experiments and practice	Engineering Tools	Engineer and society	Environment & sustainability	Ethics	Individual and Team work	Communication	Lifelong learning	Linked PO
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	
CO1	2	2	2							3	1,2,3,10
CO2		2	3		2					2	1,2,3,10
CO3	2	2	3							3	1,2,5,10
CO4	2	2	3		2					2	2,10
CO5		3	3		2					2	2,10
CO6	2	2	3		3					3	2,10

Internal Evaluation

Test	Units	Marks
Mid Sem 1	1 and 2	20
Mid Sem 2	3 and 4	20
Slip Test 1	1 and 2	5
Slip Test 2	3 and 4	5
Assignments	-	5
Seminars	-	5
	Total	60

QUESTION PAPER PATTERN FOR MID SEMESTER EXAMS

Sl.No	Description	Level	No of Questions	Marks for each question	Choice	Total Marks
01	Part-A	Remembering(R)	4	1	Nil	4 Marks
02	Part-B	Understanding(U)	4	3	2	6 Marks
03	Part-C	Application(A)	4	5	2	10 Marks
Total Marks						20 Marks

MID SEM-I EXAM

S.No	Unit No	R	U	A
1	Unit-I	1,2	5(a)	7(a)
			5(b)	7(b)
2	Unit-II	3,4	6(a)	8(a)
			6(b)	8(b)
Total Questions		4	4	4

MID SEM-II EXAM

S.No	Unit No	R	U	A
1	Unit-III	1,2	5(a)	7(a)
			5(b)	7(b)
2	Unit-IV	3,4	6(a)	8(a)
			6(b)	8(b)
Total Questions		4	4	4

The length of answer for each question framed in respect of Part-A, B&C shall not exceed $\frac{1}{4}$ of a page side, 1 page side and 2page sides respectively

QUESTION PAPER PATTERN FOR SEMESTER END EXAM

Sl.No	Description	Level	No of Questions	Marks for each question	Choice	Total Marks
01	Part-A	Remembering(R)	8	1	Nil	8 Marks
02	Part-B	Understanding(U)	8	3	4	12 Marks
03	Part-C	Application(A)	8	5	4	20 Marks
Total Marks						40 Marks

Unit No	Questions to be set for SEE				
	R		U		A
I	Q4	Q1		Q9(a)	Q13(a)
II					
III		Q2		Q10(a)	Q14(a)
IV					
V		Q3	Q9(b), Q11(a), Q11(b)		Q13(b), Q15(a), Q15(b)
VI			Q10(b), Q12(a), Q12(b)		Q14(b), Q16(a), Q16(b)
Total Questions	8		8		8

STATE BOARD OF TECHNICAL EDUCATION & TRAINING , TELANGANA
DIPLOMA IN ELECTRICAL & ELECTRONICS ENGG.
SUB CODE: 18EE-504E (B)
ADVANCED PROTECTION OF POWER SYSTEMS
MID SEM -I MODEL PAPER

TIME: 1 HOUR

TOTAL MARKS: 20

Important Note: Wherever any question has choice, marks will be allotted only to first attempted question. **No marks will be allotted for extra questions answered**

PART – A

Marks: 4Q X 1= 04

- Instructions:** (1) Answer all questions
(2) Each question carries **One** mark.
1. Define switchgear.
 2. Define Arc.
 3. Define Relay.
 4. State any two requirements of relay.

PART - B

Marks: 2Q x 3 = 06

- Instructions:** (1) Answer all questions
(2) Each question carries **Three** marks.
- 5(a) Classify different types of switchgear .
or
5(b) State any one method of arc quenching.

- 6(a) Classify relays based on principle of operation
Or
6(b) List the applications of Impedance Relay.

PART - C

Marks: 2Q x 5= 10

- Instructions:** (1) Answer all questions
(2) Each question carries **Five** marks.
- 7(a) Explain with neat sketch the working of Air Blast Circuit Breaker.
or
7(b) Draw a neat sketch of SF6 Circuit Breaker.
- 8(a) Explain the working of directional Over current Relay.
Or
8(b) Describe the Current Differential Protection.

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SUB CODE: 18EE-504E (B)
ADVANCED PROTECTION OF POWER SYSTEMS
MID SEM -II MODEL PAPER

TIME: 1 HOUR

TOTAL MARKS: 20

PART – A

Marks: 4Q X 1= 04

Instructions: (1) Answer all questions
(2) Each question carries **One** mark.

1. Define Static Relay.
2. Define Comparator.
3. List the protection schemes of Alternator.
4. List the possible faults in a transformer.

PART - B

Marks: 2Q x 3 = 06

Instructions: (1) Answer all questions.
(2) Each question carries Three marks.

- 5(a) State the advantages of Static relay over Electromagnet relay
or
5(b) State the need for time delay in Static relaying
- 6(a) State the effects of faults on Alternator Stator
or
6(b) Describe the protection of Excessive heating of Alternator

PART - C

Marks: 2Q x 5= 10

Instructions: (1) Answer all questions
(2) Each question carries **Five** marks.

- 7(a) Explain the Hall Effect type of Phase comparator
or
7(b) Explain the coincidence type phase comparators
- 8(a) Explain the differential protection for alternator stator.
or
8(b) Explain the working of Buchholz Relay and its protection scheme for transformer.

18EE-504E(B)

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TELANGANA
DIPLOMA IN ELECTRICAL & ELECTRONICS ENGG.
SUB CODE: 18EE-504E(B)
ADVANCED PROTECTION OF POWER SYSTEMS

SEMESTER END EXAM MODEL PAPER

TIME: 2 HOURS

TOTAL MARKS: 40

PART – A

Marks: 8Q X 1= 10

Instructions: (1) Answer all questions
(2) Each question carries **one** mark.

1. Define Arc.
2. State any two requirements of relays.
3. Define comparator.
4. List possible faults in transformer
5. Define surge
6. State the need for pilot wire protection scheme.
7. Define digital relay.
8. Mention any two advantages of numerical relay over conventional relays.

PART - B

Marks: 4Qx3=12

Instructions: (1) Answer any Four Questions
(2) Each question carries Three marks.

- 9(a) State any one method of arc quenching.
Or
9(b) State the advantages of static relay over electromagnet relay
- 10(a) Describe how relays are used as comparators.
Or
10(b) State the purpose of sample and hold circuit.
- 11(a) List any three types of lightning arrestor.
Or
11(b) List types of surges.
- 12(a) List the applications of digital relays.
Or
12(b) State the limitations of digital relays.

PART - C

Marks: 4Qx5=20

Instructions: (1) Answer any Four Questions
(2) Each question carries Five marks

- 13(a) Explain the working of induction type over current relay.
Or
13(b) Explain the protection of parallel feeders using directional relay.
- 14(a) Explain about earth fault protection for stator of alternator.
Or
14(b) Explain with block diagram the working of numerical over current relay.
- 15(a) Explain the protection of transmission lines by definite distance relay.
Or

15(b) Explain protection scheme of double bus bars.

16a) Explain with block diagram the working of digital relay.

Or

16(b) Explain with block diagram the working of transformer numerical differential relay.

ELECTRICAL ESTIMATION AND UTILIZATION

Course Title	: Electrical Estimation and Utilization	Course Code	: 18EE-505C
Semester	: V		
Teaching Scheme in Periods : 45:15:0 (L:T:P)		Course Group	: Core
Methodology	: Lecture + Tutorial	Credits	: 3
CIE	: 60 Marks	Total Contact Periods	: 60
(Continuous Internal Evaluation)		SEE	: 40 Marks
		(Semester End Examination)	

Pre requisites

This course requires the knowledge of basic principles of electricity, electrical workshop, types of loads in domestic and industrial use. It also requires fundamental understanding of types of lamps, heating devices, welding meaning, various motors and their characteristics.

Course Outcomes

CO1 :	Infer various wiring systems and estimate the materials required for domestic wiring
CO2 :	Estimate the materials required for power loads, irrigation pumps and earthing system
CO3 :	Estimate materials required for over head line and distribution substations.
CO4 :	Perceive laws of illumination and requirements of good lighting
CO5 :	Analyze electric heating, methods of electric heating and welding
CO6 :	Analyze train electrification and speed time curves , tractive effort and various traction equipment used

Blue Print of Marks for SEE

Unit No	Unit Name	Periods	Questions to be set for SEE				
			R		U	A	
1	Wiring Systems and Estimation of Lighting / Domestic Load	10	Q4	Q1	Q9(a)	Q13(a)	
2	Estimation of Power Loads, Irrigation Pumps and Earthing system	10					
3	Estimation of OH Lines and Distribution Substations	10		Q2	Q10(a)	Q14(a)	
4	Electrical Lighting	10					
5	Electrical Heating and Welding	10		Q3	Q5, Q6	Q9(b), Q11(a), Q11(b)	Q13(b), Q15(a), Q15(b)
6	Electric Traction	10			Q7, Q8	Q10(b), Q12(a), Q12(b)	Q14(b), Q16(a), Q16(b)
Total		60	8		8	8	

Course Content

UNIT 1 – Wiring systems and Estimation of Lighting / Domestic Load

Duration: 10 Periods (L: 7.5 – T: 2.5)

Types of house wiring systems - Various types of cables – Various types of Main switches - Different types of fuses , fuse carriers, isolators and MCBs -Types of service mains - Estimation of domestic lighting installation and their specifications - quantity of materials required – Estimation and selection of interior wiring system suitable to a given building

UNIT 2 – Estimation of Power Loads, Irrigation Pumps and Earthing system

Duration: 10 Periods (L: 7.5 – T: 2.5)

Wiring layouts - Estimate for a small workshop - Estimate for the installation of Irrigation pump up to 10 HP - Estimate for the installation of submersible pump - estimation of materials required in electrical Earthing

UNIT 3 - Estimation of OH Lines and Distribution Substations

Duration: 10 Periods (L: 7.5– T: 2.5)

Distribution lines of 11 kV and 400V OH lines - estimation - Cross arms - clamps - insulators - Estimation of quantity of materials required for structures- pole mounted substation and plinth mounted substation –Indian Electricity act 2003.

UNIT 4 - Electrical Lighting

Duration: 10 Periods (L: 7.5 – T: 2.5)

Nature of light and its production, Terms and definitions plane and solid angle, luminous flux, Lumen, C.P. Illumination, brightness, polar curve, MHCP, MSCP, MHSCP, -Lux meter- types of lamps - Requirements of good lighting different types of lamp fittings- laws of illumination- Terms and factors used in design of lighting schemes for indoor –Illumination levels for indoor and outdoor applications- problems-LED lamps-Environmental aspects

UNIT 5 – Electrical Heating and Welding

Duration: 10 Periods (L: 7.5 – T: 2.5)

Advantages of electric heating - requirements of good heating material and materials generally employed, resistance heating - Principle and applications - Electric arc furnaces - direct and indirect types - applications - Induction heating core type and coreless type - Applications - Dielectric heating – principle and applications.

Types of welding - Principle and applications of Resistance welding - spot welding -seam welding - butt welding - Arc welding -Metal Arc welding- Carbon Arc welding - Welding generator - welding transformer - Sequence welding circuits

UNIT 6 - Electric Traction

Duration: 10 Periods (L:7.5 - T: 2.5)

Introduction-different systems of train electrification-speed time curves different types of train services, urban and sub-urban-factors affecting scheduled speed -problems -Coefficient of adhesion-factors affecting the coefficient of adhesion-Tractive effort - Traction motors A.C&D.C—over head equipment- Current collecting gears-Booster transformer– MAGLEV

Recommended Books

1. Electrical motors applications and control by M.V.Deshpande
2. Electrical power by S.L.Uppal
3. Electrical power by J.B.Gupta
4. Electrical Technology Vol III by B.L. Theraja
5. Electric Traction by H. Partab
6. Electric Traction A.T. Dover
7. Electric Traction Hand Book Sir Isaac Pitman & sons Ltd., London
8. Utilisation of Electrical Energy. (in SI units) E.O. Taylor (Indian Edition)
9. A course in Electrical Power (in SI units) J.B. Gupta
10. S.L.Uppal-Electrical Wiring, Estimating & costing Electrical wiring
11. Electrical Drawing – Balbir Singh
12. Electrical wiring – Aurora
13. J.B.Gupta -Estimating & costing

Suggested E-Learning references

1. <http://electrical4u.com/>
2. www.nptel.ac.in
3. <https://youtube.com>
4. <https://3.imimg.com/data3/JA/HU/MY-7591709/copper-earthing-electrodes.pdf>

Suggested Learning Outcomes

After completion of the subject, the student shall be able to

- 1.1 List the different types of wires used in House wiring.
- 1.2 List the different types of single phase and three phase cables
- 1.3 State the uses of standard wire gauge.
- 1.4 Specify the gauge of wire and number of strands in a multi strand by giving its current carrying capacity
- 1.5 List the different types of wiring systems
- 1.6 Explain Surface conduit wiring system
- 1.7 Explain Concealed wiring system.
- 1.8 List the various types of Main Switches
- 1.9 State the specifications of MCB
- 1.10 State the types of MCBs
- 1.11 State the applications of MCCB, ELCB and RCCB.

- 1.12 State the applications of Distribution board
- 1.13 Specify the fuse carrier material used and the applications of Rewirable (Kit Kat) fuses
- 1.14 Specify the fuse carrier material used and the applications of Open type fuse
- 1.15 Specify the fuse carrier material used and the applications of Cartridge fuses
- 1.16 Explain different types of service mains
- 1.17 Select the service main suited to the given situation
- 1.18 List the schedule of rates used in preparing estimate.
- 1.19 Estimate the material requirement for indoor wiring given the plan of a building and draw the Wiring Layout of a Single Room
- 1.20 Estimate the material requirement for indoor wiring given the plan of a building and draw the Wiring Layout of a 2-BHK House
- 1.21 Describe the test procedure to conduct Polarity Test of wiring in an electrical installation.
- 1.22 Explain the procedure for conducting Insulation test before energizing a new domestic installation.

- 2.1 Draw the wiring layout for an office building
- 2.2 Prepare layout and draw single line wiring diagrams as per standard practice for a given set of machines in a workshop / electrical laboratory.(Upto 3 motors)
- 2.3 Calculate the suitable wire sizes for various circuits
- 2.4 Estimate the materials used for installation of 3 phase induction motor with DOL starter
- 2.5 Estimate the materials used for installation of 3 phase induction motor with Y- Δ starter
- 2.6 Select the type of wiring and service mains used for the irrigation pump set
- 2.7 List the materials used in the installation of the irrigation pump set.
- 2.8 Prepare an estimate for electrifying the irrigation pump set scheme
- 2.9 Prepare estimation for submersible pump installation
- 2.10 State the purpose of earthing
- 2.11 State the types of earthing.
- 2.12 Select the suitable type of earthing for a given installation as per IS3043.
- 2.13 Prepare the estimate for pipe earthing.
- 2.14 Prepare the estimate for plate earthing.
- 2.15 State the concept of maintenance free chemical gel earthing.
- 2.16 Explain the method of chemical gel earthing.

- 3.1 State the requirements of line supports used in overhead lines
- 3.2 List the factors influencing the selection of line supports
- 3.3 List the types of line supports
- 3.4 State the need for cross arms
- 3.5 State the types of cross arms
- 3.6 Calculate the total number of insulators required for the given scheme
- 3.7 Select the type of insulators to be used for overhead lines.
- 3.8 Select the type, size and number of cross arms required for the overhead line
- 3.9 Determine the size and total length of overhead conductor required for the line giving due consideration for the sag to be allowed

- 3.10 Estimate the quantity of all materials required for given 11 KV overhead lines as per standard practice followed by NEC
- 3.11 Estimate the quantity of all materials required for given 400V overhead lines as per standard practice followed by NEC
- 3.12 Estimate the quantity of material required for pole mounted transformer substations
- 3.13 Estimate the quantity of material required for plinth mounted transformer substation
- 3.14 State the salient features of Indian Electricity Act 2003
- 3.15 State the function of Central Electricity Authority.

4.1 Explain the nature of light and its propagation

4.2 Define the following terms.

- | | | | |
|---------------------------|------------------|-----------------------|----------|
| a) Plane and solid angles | b) Luminous flux | c) Luminous intensity | d) Lumen |
| e) Candle power | f) Illumination | g) Brightness | |
| h) Polar curve | i) MHCP | j) MSCP | k) MHSCP |

4.3 List the types of lamps used for illumination for different situations such as domestic, industrial, decoration, advertisement and street lighting schemes.

4.4 Define glare.

4.5 State the requirements of good lighting

4.6 Explain different types of lamp fittings.

4.7 State the uses and advantages of each type of fitting

4.8 State and explain the laws of illumination

4.9 Solve problems on laws of illumination.

4.10 Define the terms:

- | | | | |
|--------------------------------|------------------------|------------------------|----------------------|
| a) Utilization factor | b) Depreciation factor | c) Waste light factor | d) Reflection factor |
| e) Reduction factor | f) Absorption factor | g) Luminous efficiency | |
| h) Specific energy consumption | i) Space -height ratio | | |

4.11 Calculate the number of lamps required for simple indoor lighting scheme

4.12 State the purpose of lux meter

4.13 Mention the illumination levels for indoor and outdoor applications

4.14 State the advantages of LED lighting over CFL lamps

5.1 State the advantages of electric heating

5.2 List the requirements of good heating material

5.3 State the materials employed for heating

5.4 Explain resistance heating - direct and indirect

5.5 List the industrial applications of resistance heating.

5.6 Explain different methods of temperature control of resistance heating with diagrams.

5.7 Explain direct arc heating

5.8. Explain indirect arc heating

5.9 List the industrial applications of arc heating.

5.10 explain induction heating – (core type and core less type)

5.11 Explain the principle of dielectric heating.

5.12 List the industrial applications of dielectric heating

5.13 State different types of electric welding.

- 5.14 Explain the principles of
i) Resistance Welding ii) Spot Welding iii) Seam Welding iv) Butt Welding
v) Arc Welding vi) Metal Arc Welding vii) Carbon Arc Welding
- 5.15 List the conditions for successful welding.
- 5.16 Explain the characteristics of a welding generator.
- 5.17 Explain with legible sketch the principle of operation of welding transformer with a reactance coil.
- 5.18 Explain the 'Sequence Weld' with a block diagram.

- 6.1 Describe Single phase A.C. and Composite systems.
- 6.2 State the advantages and disadvantages of electric traction.
- 6.3 List the types of services (main line, suburban and urban),
- 6.4 Sketch the speed time curves for i) Main Line ii) sub urban services iii) Urban services.
- 6.5 State each stage of the speed time curve with appropriate speed used.
- 6.6 State the importance of speed time curves.
- 6.7 Define Maximum speed, Average speed and Scheduled speed.
- 6.8 List the factors affecting the Scheduled Speed.
- 6.9 Sketch the simplified Speed Time Curves.
- 6.10 Explain the practical importance of the above curves.
- 6.11 Write the expression for Maximum Speed, Acceleration and Retardation for Trapezoidal Speed Time Curve
- 6.12 Solve simple problems on Trapezoidal Speed Time Curve.
- 6.13 Explain the Tractive Effort.
- 6.14 Write the expression for Tractive Effort for Acceleration, to overcome gravity pull and train resistance.
- 6.15 Define 'Coefficient of Adhesion'.
- 6.16 List the factors affecting the Coefficient of Adhesion.
- 6.17 State the methods of improving the Coefficient of Adhesion.
- 6.18 State the important requirements of traction motors(A.C and D.C)
- 6.19 State the purpose and material used for catenary
- 6.20 State the purpose and material used droppers
- 6.21 State the purpose and material used trolley wires
- 6.22 State the purpose and material used bow collector
- 6.23 State the purpose and material used pantograph collector
- 6.24 State the Need of Booster Transformer
- 6.25 Draw the Connection diagram of booster transformer
- 6.26 Explain the Concept of MAGLEV and its applications

Suggested Student Activities

1. Student visits to the houses which are under construction so as to visualize the pipe layout and accessories fixtures
2. Student visits Distribution Transformer i.e., Pole mount and Plinth mount
3. Visit to nearby field and understand the Irrigation pump estimation
4. Visit to small industry or workshop and estimate the load and rating of the accessories required
5. Group discussion
6. Surprise test
7. Student visits to the Industries, Malls and software companies which operate at night to understand the importance of Lighting , to shops which provide lighting solutions
8. Prepare a report on illumination required for both indoor and outdoor applications
9. Student visits Industries where Electrical heating methods are employed and their purpose of heating
10. Visit to nearby Welding shop and also to industries which make use of Electric welding process
11. Visit to Traction workshop of Railway and understand its operation
12. Quiz

CO-PO Mapping Matrix

	Basic knowledge	Discipline Knowledge	Experiments and practice	Engineering Tools	Engineer and society	Environment & sustainability	Ethics	Individual and Team work	Communication	Lifelong learning	Linked PO
CO\PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	
CO1	2	3	2	1	2	-	2	1	-	3	1,2,3,4,5,7, 8,10
CO2	2	3	2	1	3	-	3	1	-	3	1,2,3,4,5,7, 8,10
CO3	2	3	2	1	3	-	3	1	-	3	1,2,3,4,5,7, 8,10
CO4	3	2			2	3				3	1,2,5,6,10
CO5	2	2			2	2				2	1,2,5,6,10
CO6	1	2			3	2				3	1,2,5,6,10

Continuous Internal Evaluation (CIE)

Test	Units	Marks
Mid Sem 1	1 and 2	20
Mid Sem 2	3 and 4	20
Slip Test 1	1 and 2	5
Slip Test 2	3 and 4	5
Assignments	-	5
Seminars	-	5
	Total	60

QUESTION PAPER PATTERN FOR MID SEMESTER EXAMS

Sl.No	Description	Level	No of Questions	Marks for each question	Choice	Total Marks
01	Part-A	Remembering(R)	4	1	Nil	4 Marks
02	Part-B	Understanding(U)	4	3	2	6 Marks
03	Part-C	Application(A)	4	5	2	10 Marks
Total Marks						20 Marks

MID SEM-I EXAM

S.No	Unit No	R	U	A
1	Unit-I	1,2	5(a)	7(a)
			5(b)	7(b)
2	Unit-II	3,4	6(a)	8(a)
			6(b)	8(b)
Total Questions		4	4	4

MID SEM-II EXAM

S.No	Unit No	R	U	A
1	Unit-III	1,2	5(a)	7(a)
			5(b)	7(b)
2	Unit-IV	3,4	6(a)	8(a)
			6(b)	8(b)
Total Questions		4	4	4

The length of answer for each question framed in respect of Part-A, B&C shall not exceed $\frac{1}{4}$ of a page side, 1 page side and 2page sides respectively.

QUESTION PAPER PATTERN FOR SEMESTER END EXAM

Sl.No	Description	Level	No of Questions	Marks for each question	Choice	Total Marks
01	Part-A	Remembering(R)	8	1	Nil	8 Marks
02	Part-B	Understanding(U)	8	3	4	12 Marks
03	Part-C	Application(A)	8	5	4	20 Marks
Total Marks						40 Marks

Unit No	Questions to be set for SEE				
	R			U	A
I	Q4	Q1		Q9(a)	Q13(a)
II					
III		Q2		Q10(a)	Q14(a)
IV					
V		Q3	Q5,Q6	Q9(b), Q11(a), Q11(b)	Q13(b), Q15(a), Q15(b)
VI			Q7,Q8	Q10(b), Q12(a), Q12(b)	Q14(b), Q16(a), Q16(b)
Total Questions	8			8	8

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TELANGANA
DIPLOMA IN ELECTRICAL & ELECTRONICS ENGG.
SUB CODE: 18EE-505C
ELECTRICAL ESTIMATION AND UTILIZATION

MID SEM -I MODEL PAPER

TIME: 1 HOUR

TOTAL MARKS: 20

PART – A

Marks: 4 X 1=4

Instructions: (1) Answer all questions
(2) Each question carries **one** mark.

1. State the uses of standard wire gauge.
2. What is a service main?
3. What is the purpose of earthing?
4. List the materials that are to be used in the Earth pit surrounding the Earth electrode

PART - B

Marks: 2 x 3 = 6

Instructions: (1) Answer the following questions.
(2) Each question carries **three** marks.

- 5a) List the different types of single phase and three phase cables

OR

- 5 b) State the types of MCBs

- 6 a) State the types of earthing.

OR

- 6 b) Specify the different materials used in pipe earthing

PART - C

Marks: 2 x 5= 10

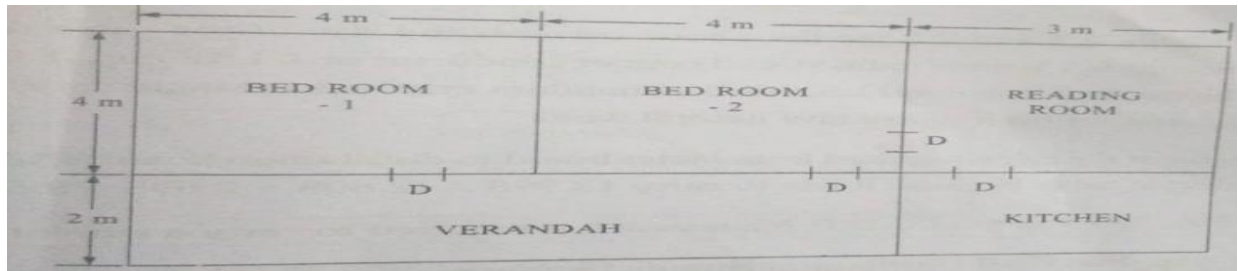
Instructions: (1) Answer the following questions.
(2) Each question carries **five** marks

- 7 a) Explain Concealed wiring system

OR

7 b) Estimate the quantity of material required and the cost of materials for wiring a newly constructed residential building whose plan is shown in Fig below and details of load are given in table below. Assume any missing data

Location	Lamp(60W)	Tube light(40W)	Fan(80W)	5A socket outlet	15A socket outlet
Verandah	1	1	1	-	-
Reading room	1	1	1	1	1
Bed room-1	1	1	1	1	-
Bed room-2	1	1	1	1	-
Kitchen	1	1	-	1	1



Plan of the House

8 a) Prepare the Estimate of materials suitable for earthing for a 132/33KV substation

OR

8 b) Draw the wiring layout for a workshop

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TELANGANA
DIPLOMA IN ELECTRICAL & ELECTRONICS ENGG.
SUB CODE: 18EE-505C
ELECTRICAL ESTIMATION AND UTILIZATION

MID SEM –II MODEL PAPER

TIME: 1 HOUR

TOTAL MARKS: 20

PART – A

Marks: 4 X 1=4

Instructions: (1) Answer all questions
(2) Each question carries **one** mark.

1. State the need for cross arms
2. List the types of line supports
3. Define MHCP
4. Define illumination

PART - B

Marks: 2 x 3 = 6

Instructions: (1) Answer the following questions.
(2) Each question carries **three** marks.

- 5a) List the factors influencing the selection of line supports

OR

- 5 b) State the types of cross arms required for overhead transmission lines
- 6 a) State the requirements of good lighting

OR

- 6 b) State the purpose of lux meter.

PART - C

Marks: 2 x 5= 10

Instructions: (1) Answer the following questions.
(2) Each question carries **five** marks.

- 7 a) Estimate the quantity of material required for pole mounted substation

OR

- 7 b) Estimate the quantity of material required for plinth mounted substation

- 8 a) State and explain Lambert's cosine law of illumination

OR

- 8 b) State the uses and advantages of each type of fitting

18EE-505C

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TELANGANA
DIPLOMA IN ELECTRICAL & ELECTRONICS ENGG.

SUB CODE: 18EE-505C
ELECTRICAL ESTIMATION AND UTILIZATION
SEMESTER END EXAM MODEL PAPER

TIME: 2 HOURS

TOTAL MARKS: 40

PART – A

Instructions: (1) Answer all questions
(2) Each question carries **one** mark.

Marks: 8 X 1 = 8

1. List the different types of wires used in house wiring
2. Define glare
3. State the purpose of using droppers in electric traction
4. Define schedule speed of an electric locomotive
5. List any two applications of direct resistance heating
6. List any two requirements of good heating material
7. List the applications of magnetic levitation
8. Define coefficient of adhesion

PART - B

Instructions: (1) Answer the following questions
(2) Each question carries **three** marks.

Marks: 4 X 3 = 12

9a) State the purpose of earthing in electrical installations

OR

9b) List the industrial applications of Dielectric Heating

10a) List the factors influencing the selection of line supports

OR

10b) State the methods of improving the Coefficient of Adhesion.

11a) List the Conditions for Successful Welding.

OR

11b) Draw the Sequence Weld block diagram

12a) State the Need of Booster Transformer

OR

12 b) State the purpose and material used for pantograph collector

PART - C

Instructions: (1) Answer the following questions
(2) Each question carries **five** marks.

Marks: 4 X 5 = 20

13a) Prepare the Estimate for Plate Earthing.

OR

13b) Prepare the quantity estimate and cost of wiring material required for an agriculture pump set of 3.7 KW 3-Phase, 400 V motor. The distance between the LT pole and the Pump set shed (5x3x3m) is 12m. Assume missing data where ever necessary

14 a) State and explain the Laws of Illumination

OR

14b) Explain Single phase A.C. and Composite systems of electric traction

15a) With the help of a neat diagram explain the construction and working of vertical core type induction furnace

OR

15b) Explain with legible sketch the principle of operation of Welding Transformer with a reactance coil.

16a) State the important requirements of traction motors

OR

16 b) Draw and explain the connection diagram of booster transformer.

AC MOTORS LAB PRACTICE

Course Title	: AC Motors Lab Practice	Course Code	: 18EE-506P
Semester	: V	Course Group	: Practical
Teaching Scheme in Periods (L:T:P)	: 15:0:30	Credits	: 1.5
Methodology	: Lecture + Practical	Total Contact Periods	: 45
CIE (Continuous Internal Evaluation)	: 60 Marks	SEE (Semester End Examination)	: 40 Marks

Pre requisites

This course requires the skills of handling electrical tools, accessories and performing wiring connections

Course Outcomes

Course Outcome	
CO1	Identify the parts of A.C motor starters
CO2	Draw and interpret the performance characteristics of single phase and three phase AC Motors by Conducting load test.
CO3	Draw the circle diagram on AC Motors by conducting suitable experiments.
CO4	Identify and rectify faults in AC motors
CO5	Prepare estimation for a given load by using Government SSR as per BIS norms.

Suggested Learning Outcomes

1.0. Identify the parts of A.C motor starters

- 1.1 Identify the parts of a DOL starter, test its parts locate faults if any. Suggest remedies.
- 1.2 Identify the parts of a manual star-delta starter, test its parts and locate faults if any. Suggest remedies.
- 1.3 Identify the parts of automatic star-delta starter, test its parts and locate faults if any. Suggest remedies.
- 1.4 Identify the parts of autotransformer starters, test its parts locate faults if any. Suggest remedies.

2.0 Draw and interpret the performance characteristics of single phase and three phase AC Motors by Conducting load test.

- 2.1. Conduct brake test on 3-phase squirrel cage induction motor.
- 2.2. Conduct brake test on 3-phase slip ring induction motor
- 2.3. Perform load test on single phase split phase induction motor.
- 2.4. Perform load test on single phase universal motor
- 2.5 Conduct load test on synchronous motor and draw V and inverted V curves

3.0 Draw the circle diagram on AC Motors by conducting suitable experiments.

- 3.1. Conduct suitable tests and draw circle diagram of squirrel cage induction motor.
- 3.2. Conduct suitable tests and draw circle diagram of slip ring induction motor

4.0. Identify and Rectify faults in AC motors.

- 4.1 Identify the part of a given AC Motors.
- 4.2 Identify and rectify faults in AC Motors.

5.0 Prepare Estimation for a given load by using Government SSR as per BIS norms.

1. (A list of Items and soft copy of SSR may be provided to student)
 2. Wiring estimate for a Residential / Commercial building.
 3. Prepare an estimate for wiring Irrigation pump set
- Note:- The staff can give suitable problems.

CO-PO MAPPING MATRIX

	Basic knowledge	Discipline Knowledge	Experiments and practice	Engineering Tools	Engineer and society	Environment & sustainability	Ethics	Individual and Team work	Communication	Lifelong learning	Linked PO
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	
CO1	1	3	3	3				3	2		1,2, 3,4,8,9
CO2	1	3	3	3				3	2		1,2, 3,4,8,9
CO3	1	3	3	3				3	2		1,2, 3,4,8,9
CO4		3	3	3				3	2		2,3,4,8,9
CO5	1	3					3	3	2		1,2,7,8,9

State Board of Technical Education and Training, Telangana
DEEE V Semester
MID SEM I MODEL QUESTION PAPER

Course Code: 18EE-506P

Duration: 1 Hour

Course Name: AC Motors Lab Practice

Max. Marks: 20

Note: Answer allotted Question.

Instructions to the Candidate:

(i) Record the results on a graph sheet if required, and conclude your observation of the experiment.

(ii) Draw the circuit diagram for illustration; choose appropriate values when not mentioned in the question.

1. Identify the parts of a DOL starter, test its parts locate faults if any. Suggest remedies.
2. Identify the parts of a manual star-delta starter, test its parts and locate faults if any. Suggest remedies.
3. Identify the parts of automatic star-delta starter, test its parts and locate faults if any. Suggest remedies.
4. Identify the parts of autotransformer starters, test its parts locate faults if any. Suggest remedies.
5. Conduct brake test on 3-phase squirrel cage induction motor.
6. Conduct brake test on 3-phase slip ring induction motor

State Board of Technical Education and Training, Telangana
DEEE V Semester
MID SEM II MODEL QUESTION PAPER

Course Code: 18EE-506P

Duration: 1 Hour

Course Name: AC Motors Lab Practice

Max. Marks: 20

Note: Answer allotted Question.

Instructions to the Candidate:

(i) Record the results on a graph sheet if required, and conclude your observation of the experiment.

(ii) Draw the circuit diagram for illustration; choose appropriate values when not mentioned in the question.

1. Perform Load test on Single phase split phase induction motor.
2. Perform Load test on Single phase universal motor
3. Conduct load test on Synchronous motor and draw V and inverted V curves.
4. Conduct suitable tests and draw circle diagram of squirrel cage induction motor.
5. Conduct suitable tests and draw circle diagram of slip ring induction motor

State Board of Technical Education and Training, Telangana
Model Question paper
DEEE V Semester
SEMESTER END EXAMINATION

Course Code: 18EE-506P

Duration: 2 Hours

Course Name: AC Motors Lab Practice

Max. Marks: 40

Note: Answer allotted Question.

Instructions to the Candidate:

(i) Record the results on a graph sheet if required, and conclude your observation of the experiment.

(ii) Draw the circuit diagram for illustration; choose appropriate values when not mentioned in the question.

1. Conduct brake test on 3-phase squirrel cage induction motor.
2. Conduct brake test on 3-phase slip ring induction motor
3. Perform load test on single phase split phase induction motor.
4. Perform load test on single phase universal motor
5. Conduct load test on synchronous motor and draw V and inverted V curves.
6. Conduct suitable tests and draw circle diagram of squirrel cage induction motor.
7. Conduct suitable tests and draw circle diagram of slip ring induction motor
8. Identify the part of a given AC Motors.
9. Identify and rectify faults in AC Motors.
10. Identify the parts of a DOL starter, test its parts locate faults if any. Suggest remedies.
11. Identify the parts of a manual star-delta starter, test its parts and locate faults if any.
Suggest remedies.
12. Identify the parts of automatic star-delta starter, test its parts and locate faults if any.
Suggest remedies.
13. Identify the parts of autotransformer starters, test its parts locate faults if any. Suggest remedies.

POWER ELECTRONICS LAB PRACTICE

Course Title	: Power Electronics Lab Practice	Course Code	: 18EE-507P
Semester	: V	Course Group	: Practical
Teaching Scheme in	: 15:0:30	Credits	: 1.5
Periods (L:T:P)		Total Contact Periods	: 45
Methodology	: Lecture + Practical	SEE	: 40 Marks
CIE	: 60 Marks	(Semester End Examination)	
(Continuous Internal Evaluation)			

Pre requisites

This course requires the knowledge of Power electronics

Course Outcomes

Course Outcome	
CO1	Acquire knowledge on specified Power electronic devices and use them
CO2	Use Single phase Half wave and full wave converters for R loads
CO3	Control the speed of DC motors using converters and choppers
CO4	Control the speed of AC motors using AC voltage controller & V/F controller
CO5	Acquire knowledge on inverters

Suggested Learning Outcomes

1.0 Characteristics of different Power electronic devices

- 1.1 Draw the Static VI characteristics of SCR
- 1.2 Draw the Static VI characteristics of IGBT
- 1.3 Draw the Static VI characteristics of DIAC
- 1.4 Draw the Static VI characteristics of TRIAC

2.0 Single phase Half wave and full wave converters for R loads

- 2.1 Verify the working of Single phase half wave controlled converter with R-load.
- 2.2 Verify the working of Single phase Full wave fully controlled converter with R-load

3.0 Speed Control of DC motors using converters and choppers

- 3.1 Control the speed of DC shunt motor using single phase fully controlled full wave converter
- 3.2 Control the speed of DC shunt motor using Chopper

4.0 Speed control of AC motors

- 4.1 Control the speed of 1 Φ induction motor using AC Voltage controller
- 4.2 Control the speed of 3 Φ induction motor using V/F controller

5.0 Inverters

- 5.1 Invert DC supply to AC supply using Series Inverter
- 5.2 Invert DC supply to AC supply using Parallel Inverter

CO-PO MAPPING MATRIX

	Basic knowledge	Discipline Knowledge	Experiments and practice	Engineering Tools	Engineer and society	Environment & sustainability	Ethics	Individual and Team work	Communication	Lifelong learning	Linked PO
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	
CO1	1	3	3	3				3	2		1,2,3,4,8,9
CO2	1	3	3	3				3	2		1,2,3,4,8,9
CO3	1	3	3	3				3	2		1,2,3,4,8,9
CO4	1	3	3	3				3	2		1,2,3,4,8,9
CO5	1	3	3	3				3	2		1,2,3,4,8,9

State Board of Technical Education and Training, Telangana
DEEE V Semester
MID SEM I MODEL QUESTION PAPER

Course Code: 18EE-507P

Duration: 1 Hour

Course Name: Power Electronics Lab Practice

Max. Marks: 20

Note: Answer allotted Question.

Instructions to the Candidate:

(i) Record the results on a graph sheet if required, and conclude your observation of the experiment.

(ii) Draw the circuit diagram for illustration; choose appropriate values when not mentioned in the question.

1. Draw the Static VI characteristics of SCR
2. Draw the Static VI characteristics of IGBT
3. Draw the Static VI characteristics of DIAC
4. Draw the Static VI characteristics of TRIAC

State Board of Technical Education and Training, Telangana
DEEE V Semester
MID SEM II MODEL QUESTION PAPER

Course Code: 18EE-507P

Duration: 1 Hour

Course Name: Power Electronics Lab Practice

Max. Marks: 20

Note: Answer allotted Question.

Instructions to the Candidate:

(i) Record the results on a graph sheet if required, and conclude your observation of the experiment.

(ii) Draw the circuit diagram for illustration; choose appropriate values when not mentioned in the question.

- 1 Verify the working of Single phase half wave controlled converter with R-load.
- 2 Verify the working of Single phase Full wave fully controlled converter with R-load
- 3 Control the speed of DC shunt motor using single phase fully controlled full wave converter
- 4 Control the speed of DC shunt motor using Chopper

State Board of Technical Education and Training, Telangana
Model Question paper
DEEE V Semester
SEMESTER END EXAMINATION

Course Code: 18EE-507P

Duration: 2 Hours

Course Name: Power Electronics Lab Practice

Max. Marks: 40

Note: Answer allotted Question.

Instructions to the Candidate:

(i) Record the results on a graph sheet if required, and conclude your observation of the experiment.

(ii) Draw the circuit diagram for illustration; choose appropriate values when not mentioned in the question.

- 1 Draw the Static VI characteristics of SCR
- 2 Draw the Static VI characteristics of IGBT
- 3 Draw the Static VI characteristics of DIAC
- 4 Draw the Static VI characteristics of TRIAC

- 5 Verify the working of Single phase half wave controlled converter with R-load.
- 6 Verify the working of Single phase Full wave fully controlled converter with R-load

- 7 Control the speed of DC shunt motor using single phase fully controlled full wave converter
- 8 Control the speed of DC shunt motor using Chopper

- 9 Control the speed of 1 Φ induction motor using AC Voltage controller
- 10 Control the speed of 3 Φ induction motor using V/F controller

- 11 Invert DC supply to AC supply using Series Inverter
- 12 Invert DC supply to AC supply using Parallel Inverter

PROGRAMMABLE LOGIC CONTROLLERS LAB PRACTICE

Course Title	: Programmable logic controllers Lab Practice	Course Code	: 18EE-508P
Semester	: V	Course Group	: Practical
Teaching Scheme in Periods (L:T:P)	: 15:0:30	Credits	: 1.5
Methodology	: Lecture + Practical	Total Contact Periods	: 45
CIE (Continuous Internal Evaluation)	: 60 Marks	SEE (Semester End Examination)	: 40 Marks

Pre requisites

This course requires the knowledge of Digital Electronics

Course Outcomes

Course Outcome	
CO1	Identify the main components of the PLC module, configure the drivers and perform ON/OFF control logic task using PLC
CO2	Develop the ladder logic program for logic gates, download it to the PLC and run the program
CO3	Develop the ladder logic program for timer & counter functions, download it to the PLC and run the program
CO4	Execute the ladder programs for PLC based model applications

Suggested Learning Outcomes

- 1.0 Identify the main components of the PLC module, configure the drivers and switching task using PLC**
 - 1.1 Identify the main components of the PLC module
 - 1.2 Identify different input devices and output field devices used in Industrial automation
 - 1.3 Perform the simple ON/OFF control task using the PLC.
 - 1.4 Perform a relay switching logic task through a PLC unit
 - 1.5 Develop a ladder logic program for Seal-In-circuit (Latch logic) using PLC, download and run the program.
 - 1.6 Implement latch(Set) and unlatch(Reset) instructions

2.0 Develop the ladder logic program for logic gates, download it to the PLC and run the program

- 2.1 Develop a ladder logic program for AND,OR and NOT gates, download the program and run it
- 2.2 Develop a ladder logic program for NAND,NOR, EX-OR and EX-NOR gates PLC, download the program and run it

3.0 Develop the ladder logic program for timer & counter functions, download it to the PLC and run the program

- 3.1 Execute the ladder logic program for T-ON(ON-Delay Timer)
- 3.2 Execute the ladder logic program for T-OFF(OFF-Delay Timer)
- 3.3 Execute the ladder logic program for RTON(Retentive on)
- 3.4 Execute the ladder logic program for CTU(count-Up counter)
- 3.5 Execute the ladder logic program for CTD(count-down Counter)

4.0 Execute the ladder programs for PLC based model applications

- 4.1 Execute the ladder logic program for stair case lighting
- 4.2 Execute the ladder logic program for DOL starter
- 4.3 Execute the ladder logic program for star delta starter

CO-PO Mapping Matrix

	Basic knowledge	Discipline Knowledge	Experiments and practice	Engineering Tools	Engineer and society	Environment & sustainability	Ethics	Individual and Team work	Communication	Lifelong learning	Linked PO
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	
CO1		2	2	2	2			2	2	3	2,3,4,5,8,9,10
CO2		2	3	2				2	2	2	2,3,4,8,9,10
CO3		2	3	2				2	2	3	2,3,4,8,9,10
CO4		2	3	2	2	2				2	2,3,4,5,6,10

State Board of Technical Education and Training, Telangana
DEEE V Semester
MID SEM I MODEL QUESTION PAPER

Course Code: 18EE-508P

Duration: 1 Hour

Course Name: Programmable Logic Controllers Lab Practice

Max. Marks: 20

Note: Answer allotted Question.

Instructions to the Candidate:

(i) Record the results on a graph sheet if required, and conclude your observation of the experiment.

(ii) Draw the circuit diagram for illustration; choose appropriate values when not mentioned in the question.

1. Identify the main components of the PLC module
2. Identify different input devices and output field devices used in Industrial automation
3. Perform the simple ON/OFF control task using the PLC.
4. Perform a relay switching logic task through a PLC unit
5. Develop a ladder logic program for Seal-In-circuit (Latch logic) using PLC, download and run the program.
6. Implement latch(Set) and unlatch(Reset) instructions
7. Develop a ladder logic program for AND,OR and NOT gates, download the program and run it
8. Develop a ladder logic program for NAND,NOR, EX-OR and EX-NOR gates PLC, download the program and run it

State Board of Technical Education and Training, Telangana
DEEE V Semester
MID SEM II MODEL QUESTION PAPER

Course Code: 18EE-508P

Duration: 1 Hour

Course Name: Programmable Logic Controllers Lab Practice

Max. Marks: 20

Note: Answer allotted Question.

Instructions to the Candidate:

(i) Record the results on a graph sheet if required, and conclude your observation of the experiment.

(ii) Draw the circuit diagram for illustration; choose appropriate values when not mentioned in the question.

- 1 Execute the ladder logic program for T-ON(ON-Delay Timer)
- 2 Execute the ladder logic program for T-OFF(OFF-Delay Timer)
- 3 Execute the ladder logic program for RTON(Retentive on)
- 4 Execute the ladder logic program for CTU(count-Up counter)
- 5 Execute the ladder logic program for CTD(count-down Counter)

State Board of Technical Education and Training, Telangana
Model Question paper
DEEE V Semester
SEMESTER END EXAMINATION

Course Code: 18EE-508P

Duration: 2 Hours

Course Name: Programmable Logic Controllers Lab Practice

Max. Marks: 40

Note: Answer allotted Question.

Instructions to the Candidate:

(i) Record the results on a graph sheet if required, and conclude your observation of the experiment.

(ii) Draw the circuit diagram for illustration; choose appropriate values when not mentioned in the question.

1. Identify the main components of the PLC module
2. Identify different input devices and output field devices used in Industrial automation
3. Perform the simple ON/OFF control task using the PLC.
4. Perform a relay switching logic task through a PLC unit
5. Develop a ladder logic program for Seal-In-circuit (Latch logic) using PLC, download and run the program.
6. Implement latch(Set) and unlatch(Reset) instructions
7. Develop a ladder logic program for AND,OR and NOT gates, download the program and run it
8. Develop a ladder logic program for NAND,NOR, EX-OR and EX-NOR gates PLC, download the program and run it
9. Execute the ladder logic program for T-ON(ON-Delay Timer)
10. Execute the ladder logic program for T-OFF(OFF-Delay Timer)
11. Execute the ladder logic program for RTON(Retentive on)
12. Execute the ladder logic program for CTU(count-Up counter)
13. Execute the ladder logic program for CTD(count-down Counter)
14. Execute the ladder logic program for stair case lighting
15. Execute the ladder logic program for DOL starter
16. Execute the ladder logic program for star delta starter

PROGRAMMING IN C LAB PRACTICE

Course Title	:Programming in C Lab Practice	Course Code	: 18EE-509P
Semester	:V	Course Group	:Practical
Teaching Scheme in Periods(L:T:P)	:15:0:30	Credits	:1.5
Methodology	:Lecture + Practical	Total Contact Periods	:45
CIE	:60 marks	SEE	:40 Marks
(Common to all branches)			

Pre requisites

Basic knowledge of Computer Operation.

Course outcomes

Course Outcome	
CO1	Write programs using input/output statements, variables and operators
CO2	Work on Constants, Variables, Data Types, Operators and Expressions in C
CO3	Construct programs on Decision making and Looping statements.
CO4	Develop programs using arrays, Strings and structures

Course Content

1. Programming Methodology and Introduction to C Language Duration: 5 Periods

Program - Define High level language and low level language-history of C language - importance of C language – Define & Differentiate Compiler, Assembler - structure of C language - programming style of C language - steps involved in executing the C program

2. Understand Constants, Variables and Data Types in C and Understand Operators and Expressions in C Duration: 15 Periods

Character set - C Tokens - Keywords and Identifiers- Constants and Variables - data types and classification - declaration of a variable - Assigning values to variables - Define an operator - Define an expression -Classify operators - List and explain various arithmetic operators with examples -Illustrate the concept of relational operators - List logical operators - various assignment operators - Increment and decrement operators - Conditional operator - List bitwise operators -List various special operators- Arithmetic

expressions- precedence and associativity of operators- Evaluation of expressions - formatted input and output.

3. Decision making and Looping statements

Duration: 10 Periods

Simple if statement with sample program – if else statement – else if statement – switch statement
- Classification of various loop statements- while statement – do-while statement - for loop statement - break and continue statements.

4. Arrays and Structures

Duration: 15 Periods

Arrays - declaration and initialization of One Dimensional - Accessing elements in the Array - Declaration and initialization of two Dimensional Arrays - sample programs on matrix addition and matrix multiplication –Strings – String handling functions - Declaration of a Structure – Structure members – Array of structures.

Course Outcome		CL	Linked PO	Teaching Hours
CO1	Write programs using input/output statements, variables and operators	R, U, A	1,2,3,4,8,9,10	5
CO2	Work on Constants, Variables, Data Types, Operators and Expressions in C	R, U, A	1,2,3,4,8,9,10	15
CO3	Construct programs on Decision making and Looping statements.	R,U, A	1,2,3,4,8,9,10	10
CO4	Develop programs using arrays, Strings and structures	U, A	1,2,3,4,8,9,10	15
			Total Sessions	45

REFERENCE BOOKS

1. Let Us C -- Yeshwanth Kanetkar BPB Publications
2. Programming in ANSI C -- E. Balaguruswamy Tata McGrawHill
3. Programming with C -- Gottfried Schaum'outline
4. C The complete Reference -- Schildt Tata McGraw Hill

List of Experiments

1. Exercise on structure of C program

2. Exercise on Keywords and identifiers
3. Exercise on constants and variables
4. Execution of simple C program
5. Exercise on operators and expressions
6. Exercise on special operators
7. Exercise on input and output of characters
8. Exercise on formatted input and output
9. Exercise on simple if statement
10. Exercise on if else statement
11. Exercise on else if ladder statement
12. Exercise on switch statement
13. Exercise on conditional operator
14. Exercise on while statement
15. Exercise on for statement
16. Exercise on do...while statement
17. Exercise on one dimensional arrays
18. Exercise on two dimensional arrays
19. Exercise on string handling functions.
20. Exercise on structure
21. Exercise on array of structures

PROJECT WORK

Course Title	:Project Work	Course Code	: 18EE-510P
Semester	:V	Course Group	: Practical
Teaching Scheme in Periods(L:T:P)	:0:0:45	Credits	:1.5
Methodology	: Practical	Total Contact Periods	:45
CIE	:60 marks	SEE	:40 Marks

SCHEME OF INSTRUCTIONS AND EXAMINATION

S. No	Subject	Duration	Items	Max Marks	Remarks
1	PROJECT WORK	6 Months	CIE		
			Mid sem-I Abstract submission	20	
			Mid sem-II Prototype project, content development, literature survey and submission of Draft copy	20	
			Internal Evaluation Final Report Internal via and seminar	20	
			SEE		
			External exam Seminar	20	
			Viva Voce	20	
			Total :		

The Project work shall carry 100 marks and pass marks are 50% a candidate failing to secure the minimum marks should repeat the Project work.

The project selected should be useful to the society.

DEEE SKILL UPGRADATION ACTIVITY SHEET

Course Title	: Skill Upgradation	Credits	:2.5
Semester	: V	Total Contact Periods	: 105
Methodology	: Activities		

Suggested Course Outcomes

CO.1 Address the identified needs of the community collaboratively to facilitate positive social change.

- a. Prepare a chart related to the topics covered in the present semester.
- b. Listen to expert talk, guest lecture, you tube video and write a summary.
- c. Participate in Haritha Haram and submit a small report about the activities.
- d. Prepare a report / PPT / poster on waste water recycling or any eco-friendly practices.
- e. Seminar on problems with possible solutions in the campus or nearby places
- f. Group discussions or enacting a play on topics creating awareness about socio-economic problems
- g. Take up a case study on identification of latest technologies to tackle day to day problems such as pollution control or traffic management and submit a report / PPT/ poster
- h. Participate in NCC

(PO5, 6, 7, 8, 9, 10)

CO.2 Listen attentively to others and respond appropriately

- a. Listen to expert talk, guest lecture, youtube video and write a summary.
- b. Participating in Group discussions or enacting a play on topics creating awareness about socio-economic problems that can be mitigated by technologies.
- c. Participate in quiz on technical aspects or current affairs
- d. Participate in Mock Interview

(PO5, 7, 8, 9, 10)

CO.3 Adapt your style to the occasion, task, and audience

- a. Group discussions or enacting a play on topics creating awareness about socio-economic problems that can be mitigated by technologies.
- b. Seminar on problems with possible solutions in the campus or nearby places
- c. Participate in Mock Interview

(PO5, 6, 7, 8, 9, 10)

CO.4 Articulate ideas in various formats including oral, written, nonverbal, visual, and electronic devices.

- a. Prepare a chart related to the topics covered in the present semester.
- b. Refer to an e-journal and submit a summary report on upcoming technologies.
- c. Visit factory / industry and submit a report/PPT on the observations made.
- d. Prepare a mini project and submit report.
- e. Prepare a report / PPT / poster on waste water recycling or any eco-friendly practices.
- f. Take up a case study on identification of latest technologies to tackle day to day problems such as pollution control or traffic management and submit a report / PPT/ poster
- g. Seminar on problems with possible solutions in the campus or nearby places
- h. Participate in Mock Interview

(PO5, 6, 7, 8, 9, 10)

CO.5 Demonstrate ability to recognize and effectively manage ambiguous ideas, experiences and situations

- a. Take up a case study on identification of latest technologies to tackle day to day problems such as pollution control or traffic management and submit a report / PPT/ poster
- b. Seminar on problems with possible solutions in the campus or nearby places

(PO5, 6, 7, 8, 9, 10)

CO.6 Analyze the interconnections between individuals and society as well as how individual actions have an impact on others.

- a. Participate in Haritha Haram and submit a small report about the activities.
- b. Participate in Swatch Bharath and write an essay on the importance of the program
- c. Participate in NCC

(PO5, 6, 7, 8, 9, 10)

CO.7 Utilize others' ideas, strengths, knowledge, and abilities to foster an inclusive environment & Develop and sustain healthy and meaningful relationships with others

- a. Prepare a mini project and submit report.
- b. Participate in Haritha Haram and submit a small report about the activities.
- c. Participate in Swatch Bharath and write an essay on the importance of the program
- d. Participate in NCC

(PO5, 6, 7, 8, 9, 10)

CO.8 Ability to recognize their strengths and those of others to work towards a shared vision.

- a. Prepare a mini project and submit report.
- b. Participate in Haritha Haram and submit a small report about the activities.
- c. Participate in Swatch Bharath and write an essay on the importance of the program
- d. Participate in NCC

(PO5, 6, 7, 8, 9, 10)

CO.9 Act in alignment with one's own values to contribute to one's life-long growth and learning.

- a. Physical activities such as sports, yoga, meditation and other relaxation techniques

(PO5, 6, 7, 8, 9, 10)

CO.10 Gain, process, and act upon knowledge regarding the effects of individual, community, national, and international level choices on ecosystems and people.

- a. Prepare a report / PPT / poster on waste water recycling or any eco-friendly practices.
- b. Take up a case study on identification of latest technologies to tackle day to day problems such as pollution control or traffic management and submit a report / PPT/ poster
- c. Take up a case study on identification of latest technologies to tackle day to day problems such as pollution control or traffic management and submit a report / PPT/ poster
- d. Seminar on problems with possible solutions in the campus or nearby places

(PO5, 6, 7, 8, 9, 10)

CO	Outcome	CO/PO Mapping
CO1	Address the identified needs of the community collaboratively to facilitate positive social change.	5, 6, 7, 8, 9, 10
CO2	Listen attentively to others and respond appropriately	5, 6, 7, 8, 9, 10
CO3	Adapt your style to the occasion, task, and audience	5, 6, 7, 8, 9, 10
CO4	Articulate ideas in various formats including oral, written, nonverbal, visual, and electronic devices.	5, 6, 7, 8, 9, 10
CO5	Demonstrate ability to recognize and effectively manage ambiguous ideas, experiences and situations	5, 6, 7, 8, 9, 10
CO6	Analyze the interconnections between individuals and society as well as how individual actions have an impact on others.	5, 6, 7, 8, 9, 10
CO7	Utilize others' ideas, strengths, knowledge, and abilities to foster an inclusive environment & Develop and sustain healthy and meaningful relationships with others	5, 6, 7, 8, 9, 10
CO8	Ability to recognize their strengths and those of others to work towards a shared vision	5, 6, 7, 8, 9, 10
CO9	Act in alignment with one's own values to contribute to one's life-long growth and learning.	5, 6, 7, 8, 9, 10
CO10	Gain, process, and act upon knowledge regarding the effects of individual, community, national, and international level choices on ecosystems and people.	5, 6, 7, 8, 9, 10

Note: The above COs may map to other POs from 1 to 4 apart from PO's 5 to 10 depending on the topic

Suggested Student Activities

1. Prepare a chart related to the topics covered in the present semester.
2. Refer to an e-journal and submit a summary report on upcoming technologies.
3. Visit factory / industry and submit a report/PPT on the observations made.
4. Prepare a mini project and submit report.
5. Listen to expert talk, guest lecture, you tube video and write a summary.
6. Participate in Haritha Haram and submit a small report about the activities.
7. Prepare a report / PPT / poster on waste water recycling or any eco-friendly practices.
8. Take up a case study on identification of latest technologies to tackle day to day problems such as pollution control or traffic management and submit a report / PPT/ poster
9. Participate in Swatch Bharath and write an essay on the importance of the program
10. Group discussions or enacting a play on topics creating awareness about socio-economic problems
11. Physical activities such as sports, games, yoga, meditation and other relaxation techniques
12. Participate in quiz on technical aspects or current affairs
13. Seminar on problems with possible solutions in the campus or nearby places
14. Participate in NCC
15. Participate in Mock interviews

Note: The above student activities will be assessed using rubrics. A sample rubrics template is given below. The subject teacher can assess students using rubrics with at least four relevant aspects.

RUBRICS MODEL (For assessing Presentation skills)

Aspects	Needs improvement	Satisfactory	Good	Exemplary
Collection of data	Collects very limited information	Collect much Information with very limited relevance to the topic	Collects some basic information with little bit of irrelevance	Collects a great deal of information with relevance
Presentation of data	Clumsy presentation of data	Presents data well; but presentation needs to be more meaningful	Presents data well but need to improve clarity	Presents data in an understandable yet concise manner
Fulfill team's roles & duties	Performs very little duties but Unreliable.	Performs very little duties and is inactive	Performs nearly all duties	Performs all duties of assigned team roles
Shares work equally	Rarely does the assigned work; often needs reminding	Usually does the assigned work; rarely needs reminding	Normally does the assigned work	Always does the assigned work without having to be reminded
Interaction with other team mates	Usually does most of the talking; rarely allows others to speak	Talks good; but never show interest in listening to others	Listens, but sometimes talks too much	Listens and speaks a fair amount
Audibility and clarity in speech	Hardly audible and unclear	Very little audibility and clarity	Audible most of the time with clarity	Audible and clear
Understanding content	Lacks content understanding and is clearly a work in progress	Little depth of content understanding	Some depth of content understanding is evident but needs improvement	Insight and depth of content understanding are evident
Content Presentation	Content is inaccurate and information is not presented in a logical order making it difficult to follow	Content is accurate and information is not presented in a logical order making it difficult to follow	Content is accurate but some information is not presented in a logical order but is still generally easy to follow	Content is accurate and information is presented in a logical order

Suggested additional aspects for assessing Leadership Qualities:

1. Carrying self
2. Punctuality
3. Team work abilities

4. Moral values
5. Communication skills
6. Ensures the work is done in time

Suggested additional aspects for assessing “Participation in social task”

- 1 Interested to know the current situation of society.
- 2 Shows interest to participate in given social task.
- 3 Reliable
- 4 Helping nature
- 5 Inter personal skills
- 6 Ensures task is completed

Suggested additional aspects for assessing “Participation in Technical task”

1. Updated to new technologies
2. Identifies problems in society that can be solved using technology
3. Interested to participate in finding possible technical solutions to identified project
4. Reliable
5. Interpersonal skills

Suggested additional aspects for Carrying Self:

- 1 Stand or sit straight.
- 2 Keep your head level.
- 3 Relax your shoulders.
- 4 Spread your weight evenly on both legs.
- 5 If sitting, keep your elbows on the arms of your chair, rather than tightly against your sides.
- 6 Make appropriate eye contact while communicating.
- 7 Lower the pitch of your voice.
- 8 Speak more clearly.