

**DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING
IV SEMESTER**

IV Semester

TEACHING AND EXAMINATION SCHEME

[illegible]

ADVANCED ENGINEERING MATHEMATICS

Course Title	: Advanced Engineering Mathematics	Course Code	: 18EE-401F
Semester	: IV	Course Group	: Foundation
Teaching Scheme in periods (L : T :P)	: 45 : 15 : 0	Credits	: 3
Methodology	: Lecture + Tutorial	Total Contact Periods	: 60
CIE	: 60 Marks	SEE	: 40 Marks

Pre requisites

This course requires the knowledge of Engg. Mathematics at Diploma first year level and Applied Engg. Mathematics at Diploma 3rd Semester level.

Course Outcomes :

At the end of the course, the student will have the ability to:

CO 1	Solve simple Homogeneous Linear Differential Equations
CO 2	Solve simple Non-Homogeneous Linear Differential Equations
CO 3	Express $f(x)$ as a Fourier series in the given interval
CO 4	Express $f(x)$ as a Fourier Half-Range Cosine series and Sine series
CO 5	Find Laplace transforms of simple functions
CO 6	Find Inverse Laplace transforms of simple functions and solve Linear Differential Equations using Laplace Transformations.

Blue Print of Marks for SEE

Unit No	Unit Name	Periods	Questions to be set for SEE				
			R		U	A	
1	Homogeneous Linear Differential equations with constant coefficients	05	Q4	Q1		Q9(a)	Q13(a)
2	Non-Homogeneous Linear Differential equations with constant coefficients	15					
3	Fourier series	10		Q2		Q10(a)	Q14(a)
4	Fourier Half-range series	05					
5	Laplace Transforms	10		Q3	Q5,Q6	Q9(b), Q11(a), Q11(b)	Q13(b), Q15(a), Q15(b)
6	Inverse Laplace transforms	15			Q7,Q8	Q10(b), Q12(a), Q12(b)	Q14(b), Q16(a), Q16(b)
Total		60	8		8	8	

Course Contents:

Unit – I

Duration: 05 Periods (L:3.0 – T:2.0)

Homogeneous Linear Differential equations with constant coefficients

Homogenous linear differential equations with constant coefficients of order two and higher with emphasis on second order.

Unit – II

Duration: 15 Periods (L:12.0 – T:3.0)

Non-Homogeneous Linear Differential equations with constant coefficients

Non-homogenous linear differential equations with constant coefficients of the form $f(D)y = X$, where X is in the form $k(a \text{ constant})e^{ax}$, $\sin ax$, $\cos ax$, x^n , ($n = 1, 2, 3$) Complimentary Function (CF), Particular Integral (PI) and General Solution (GS).

Unit-III

Duration: 10 Periods (L: 8.0 – T: 2.0)

Fourier series

Orthogonality of trigonometric functions, Representation of a function in Fourier series over the interval $(c, c + 2\pi)$, Euler's formulae, sufficient conditions for existence of Fourier series for a function. Even, Odd functions and Fourier series over the Interval $(0, 2\pi)$ and $(-\pi, \pi)$

Unit – IV

Duration: 05 Periods (L: 3.0 – T: 2.0)

Fourier Half-range series

Representation of a function as Fourier Half-range Sine series and Cosine series over the interval $(0, \pi)$

Unit – V

Duration: 10Periods (L: 7.0 – T:3.0)

Laplace Transformations:

Definition, sufficient conditions for existence of Laplace Transform, Laplace Transform of elementary functions, linearity property, Change of scale property, First shifting theorem, multiplication by t^n , division by t , Laplace Transform of derivatives and integrals, unit step function, Laplace Transform of second shifting theorem

Unit – VI

Duration: 15 Periods (L: 12.0 – T: 3.0)

Inverse Laplace transforms:

Inverse Laplace transforms- shifting theorems and change of scale property, multiplication by s^n and division by s –Inverse Laplace Transform using partial fractions – convolution theorem (no proof) – application of Laplace Transformations to solve ordinary differential equations of second order with initial conditions.

Recommended Books:

1. Higher Engineering Mathematics, B.S.Grewal .
2. Laplace Transforms - Murray R. Spiegel .
3. Ordinary Differential Equations – R. S. Aggarwal.
4. Fourier Series – A.R. Vasishtha and Gupta.

Suggested E-Learning references:

1. www.freebookcentre.net/mathematics/introductory-mathematics-books.html

2. E-books: www.mathebook.net

Suggested Learning Outcomes

Unit-I

1.0 Solve Homogeneous linear differential equations with constant coefficients in engineering situations

- 1.1 Solve Differential equations of the type $(aD^2 + bD + c)y = 0$ when the roots of the auxiliary equation are real and different, real and repeated, complex.
- 1.2 Solve the higher order homogeneous Linear differential equations with constant coefficients.

Unit-II

2.0 Solve Non Homogeneous linear differential equations with constant coefficients in engineering situations

- 2.1 Explain the concept of complementary function, particular Integral and general solution of a differential equation.
- 2.2 Solve n^{th} order differential equation of the type $f(D)y = X$ where $f(D)$ is a polynomial of second order and X is a function of the form $k, e^{ax}, \sin ax, \cos ax, x^n$.
- 2.3 Solve simple problems on the above types of 2.2

Unit-III

3.0 Understand the Fourier series expansion of functions

- 3.1 Define the orthogonality of functions in an interval.
- 3.2 Define Fourier series of a function on the interval $(C, C+2\pi)$ and write the Euler's formulae for determining the Fourier coefficients.
- 3.3 Write sufficient conditions for the existence of Fourier series for a function.
- 3.4 Write Fourier series of simple functions in the range $(0, 2\pi)$ and $(-\pi, \pi)$.
- 3.5 Write Fourier series for even and odd functions in the interval $(-\pi, \pi)$

3.6 Solve simple problems on even and odd functions in the interval. $(0, 2\pi)$ and $(-\pi, \pi)$

Unit- I

4.0 Understand the Half – Range Fourier series expansion of functions

4.1 Write Half – Range Cosine series of a function in the range $(0, \pi)$.

4.2 Write Half – Range Sine series of a function in the range $(0, \pi)$.

4.3 Solve simple problems on Half – Range Cosine and Sine series over the interval $(0, \pi)$

Unit-V

5.0 Understand Laplace transforms

5.1 Write the definition of Laplace Transform and Laplace transform of standard functions.

5.2 Explain the sufficient conditions of existence of Laplace Transform.

5.3 Write the properties of Laplace Transform – Linearity property, First shifting theorem, Change of Scale property.

5.4 Solve simple problems using the above properties.

5.5 Write formulae for Laplace transform of $t^n f(t)$, $\frac{f(t)}{t}$, $f^n(t)$, $\int_0^t f(u) du$
in terms of Laplace transform of $f(t)$

5.6 Solve simple problems using the above formulae.

5.7 Define unit step function and write the Laplace Transform of unit step function.

5.8 Write Second shifting theorem.

Unit-VI

6.0 Use Laplace transforms and Inverse Laplace transforms to solve differential equation in engineering problems

6.1 Define inverse Laplace Transform and write inverse Laplace Transforms of standard functions.

6.2 Solve simple problems on Inverse Laplace Transforms.

- 6.2 Write Shifting theorems and Change of scale property of inverse Laplace Transform.
- 6.3 Solve simple problems on 6.2
- 6.4 Write inverse Laplace Transforms corresponding to Laplace Transform of the functions $t^n f(t), \frac{f(t)}{t}, f^n(t), \int_0^t f(u)du$
- 6.5 Solve simple problems on 6.4
- 6.6 Define convolution of two functions and state convolution theorem.
- 6.7 Solve simple problems on Convolution theorem.
- 6.8 Use Laplace and inverse Laplace Transforms to solve simple differential equations of Second order.

Suggested Student Activities:

- 1. Student visits Library to refer Standard Books on Mathematics and collect related material.
- 2. Quiz
- 3. Group discussion
- 4. Surprise tests
- 5. Seminars
- 6. Home Assignments.

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			1			3	1,2,3,4,7,10
CO2	3	2	2	1			1			3	1,2,3,4,7,10
CO3	3	2	2	1			1			3	1,2,3,4,7,10
CO4	3	2	2	1			1			3	1,2,3,4,7,10
CO5	3	2	2	1			1			3	1,2,3,4,7,10
CO6	3	2	2	1			1			3	1,2,3,4,7,10

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	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 $\frac{1}{4}$ of a page, 1page and 2 pages 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
BOARD DIPLOMA EXAMINATIONS
MID SEM –I, MODEL PAPER, IV SEMESTER
ADVANCED ENGINEERING MATHEMATICS

TIME: 1: 00 Hours

Max. Marks: 20

PART-A

Instructions: 1. Answer **ALL** questions 04 X 01 = 04
 2 Each question carries **ONE** mark

1. Write the General solution of $(aD^2 + bD + c)y = 0$, whose roots of auxiliary equation are real and distinct.
2. Find the roots of auxiliary equation of the differential equation $(D^2 + 2D + 1)y = 0$
3. Find the Particular Integral of $(D^2 - 4D + 1)y = e^{3x}$
4. Find the P.I of $(D^2 - 16)y = \sin 4x$

PART-B

Instructions: 1. Answer any **TWO** questions 02 X 03 = 06
 2. Each question carries **THREE** marks

5 a) Solve: $(D^2 + 3D - 54)y = 0$

Or

5 b) Solve : $(D^2 + 16)y = 0$

6 a) Solve : $(D^2 + 4D + 4)y = e^{2x}$

Or

6 b) Find P.I of $(D^3 + D)y = \sin 2x$

PART C

Instructions: 1. Answer **ALL** questions 02 X 05 = 10
 2. Each question carries **FIVE** marks

7 a) Solve : $(D^3 - 2D^2 - 4D + 8)y = 0$

Or

7 b) Solve : $(D^3 - D^2 - D + 1)y = 0$

8 a) Solve : $(D^2 + 36)y = \sin^2 x$

Or

8 b). Solve : $(D^2 + 3D + 2)y = x^2$

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Code: 18EE-401F

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TELANGANA
BOARD DIPLOMA EXAMINATIONS
MID SEM –II, MODEL PAPER, IV SEMESTER
ADVANCED ENGINEERING MATHEMATICS

TIME: 1: 00 Hours

Max. Marks: 20

PART-A

Instructions:

1. Answer **ALL** questions

04 X 01 = 04

2 Each question carries **ONE** mark

1. Define periodic function and give one example
2. Define Fourier series of the function $f(x)$ in the interval $(0, 2\pi)$
3. Write Half-range sine series of $f(x)$ in the interval $(0, \pi)$
4. Find a_0 for $f(x) = e^x$ in $0 < x < \pi$

PART-B

Instructions:

1. Answer any **TWO** questions

02 X 03 = 06

2. Each question carries **THREE** marks

5 a). If $f(x) = x^2$ in $(0, 2\pi)$, then find the value of a_n in Fourier series of $f(x)$

Or

5 b) If $f(x) = |x|$ in $(-\pi, \pi)$, then find the value of a_1 in Fourier series of $f(x)$

6 a). Find the value of a_n in half-range Cosine series for the function $f(x) = e^x$ in $(0, \pi)$

Or

6 b). Obtain the Fourier Half – Range Sine series for $f(x) = (\pi - x)$ in the interval $(0, \pi)$

PART C

Instructions:

1. Answer any **TWO** questions

02 X 05 = 10

2. Each question carries **FIVE** marks

7 a). Obtain the Fourier series for $f(x) = x$ in the interval $0 < x < 2\pi$

Or

7 b). Find the Fourier series for $f(x) = (x - x^2)$ in the interval $(-\pi, \pi)$. Hence show that

$$\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \dots + \frac{\pi^2}{12}$$

8 a) Express $f(x) = \pi x - x^2$ as a half-range Sine series in $(0, \pi)$

Or

8 b). Find the half –range cosine series for the function $f(x) = x^2$ in the interval $(0, \pi)$

18EE-401F

BOARD DIPLOMA EXAMINATION, (C-18)
SEMESTER END EXAM MODEL PAPER
IV SEMESTER EXAMINATION
ADVANCED ENGINEERING MATHEMATICS

Time: 2 hours

[Total Marks: 40]

PART-A

Instructions:

1. Answer **ALL** questions

08 X 01 = 08

2 Each question carries **ONE** mark

1. Find the roots of auxiliary equation of the differential equation $(D^2 + 4D)y = 0$.
2. Define Fourier Series for the function $f(x)$ in the interval $(c, c+2\pi)$
3. Find the Particular Integral of $(D^2 - 4D + 1)y = e^x$
4. Find $L(e^{2t} + \cos 3t)$
5. Find $L(t + 5\cosh t)$
6. State the First Shifting theorem of Laplace Transforms.
7. Find $L^{-1}\left(\frac{1}{s-3} + \frac{s}{s^2+4}\right)$
8. Find $L^{-1}\left(\frac{1}{2s+5}\right)$

PART-B

Instructions:

1. Answer any **FOUR** questions

04 X 03 = 12

2. Each question carries **THREE** marks

9. a) Solve: $(D^2 + D + 1)y = 4e^{3x}$

Or

- 9 b) Find $L(t\cos 3t)$

- 10 a) Find Half Range Sine Series of $f(x) = x$ in $(0, \pi)$

Or

10 b) Find $L^{-1}\left(\frac{s+1}{s^2+6s-7}\right)$

11 a) If $L\{f(t)\} = \frac{20-4s}{s^2-4s+20}$, find $L\{f(3t)\}$

Or

11 b) Find $\int_0^\infty t \cdot e^{-2t} \sin 3t dt$ using Laplace Transform Technique

12 a) Show that $L^{-1}\left(\frac{1}{s(s^2+a^2)}\right) = \frac{1-\cos at}{a^2}$

12 b) Find $L^{-1}\left(\frac{s}{(s+2)^2+4}\right)$

PART C

Instructions: 1. Answer any **FOUR** questions

04 X 05 = 20

2. Each question carries **FIVE** marks

13. a) Solve : Solve: $(D^2 + D - 2) y = x + \sin x$

Or

13 b) Find $L[te^t \sin 3t]$

14 a) Expand $f(x) = x^2$ as a Fourier series in the interval $(-\pi, \pi)$

Or

14 b) Find $L^{-1}\left(\frac{s}{(s+1)^2(s^2+1)}\right)$

15 a) Find $L\left(\frac{\sin 3t \cdot \cos t}{t}\right)$

Or

15 b) Evaluate $L\left\{\int_0^t \frac{\sin t}{t} dt\right\}$

16 a) Find $L^{-1}\left(\frac{1}{(s+1)(s+2)}\right)$ using Convolution theorem .

Or

16 b). Solve the differential equation $y'' - 2y' - 8y = \sin t$, when $y(0) = 3$, $y'(0) = 6$ by

Laplace Transform method.

ELECTRICAL POWER SYSTEMS

Course Title	: Electrical Power Systems	Course Code	: 18EE-402C
Semester	: IV semester	Course Group	: Core
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

Pre requisites

This course requires the knowledge of

- (i) Basic principle and working of generator, transformers
- (ii) Voltage and current calculations in the circuits using KCL,KVL

Course Outcomes

CO1 :	Differentiate various Energy sources & Describe the working of Thermal power station
CO2 :	Describe the construction and working of Hydroelectric power station and Nuclear Power station
CO3 :	Describe various types of Transmission Systems.
CO4 :	Evaluate the performance of transmission lines
CO5 :	Describe Electrical and Mechanical aspects of Transmission and Distribution lines
CO6 :	Evaluate various aspects in Distribution systems.

Blue Print of Marks for SEE

Unit No	Unit Name	Periods	Questions to be set for SEE				
			R		U	A	
1	Sources of Energy &Thermal Power Station	10	Q4	Q1	Q9(a)	Q13(a)	
2	Hydro Electric Power Station &Nuclear Power Station	10					
3	AC & DC Transmission systems	10		Q2	Q10(a)	Q14(a)	
4	Performance of the transmission lines	10					
5	Line structures for Transmission and Distribution lines	10		Q3	Q5,Q6	Q9(b), Q11(a), Q11(b)	Q13(b), Q15(a), Q15(b)
6	Distribution systems	10					
Total		60	8		8	8	

Course Content

UNIT 1 - Sources of Energy & Thermal Power Station

Duration: 10 Periods (L:7.5– T:2.5)

Different sources of energy - Need for Non-Conventional Energy based power generation – Methods of generation of energy from different sources of power- Merits and Limitations of Conventional and Non-conventional sources - Thermal Power Station - pulverization, Condensation – Types of cooling towers.

UNIT 2– Hydro Electric Power Station & Nuclear Power Station

Duration: 10 Periods (L:7.5– T:2.5)

Hydro Electric Power Station - Factors for site selection and limitations in location –Hydrograph - Classification of hydroelectric power - Layout diagram of various Hydro Power Stations –Nuclear energy, fission and fusion reactions - Merits of using nuclear energy. Nuclear fuels - Working of moderator type nuclear power station with a block diagram - Materials used for coolant, reflector and control rods.

UNIT 3 –AC and DC Transmission systems

Duration: 10 Periods (L:7.5 – T:2.5)

Transmission Lines- classification of Transmission systems - Relative advantages of AC & DC Transmission - Basic Concept of High voltage DC Transmission - Types of HVDC transmission- Advantages and disadvantages of HVDC transmission - Types of conductor – Current distortion effects.

UNIT 4 - Performance of the transmission lines

Duration: 10 Periods (L:7.5 – T:2.5)

Transmission line parameters – Expressions for Inductance of transmission system –Problems on computing Inductance - Expression for capacitance of a of transmission system-Problems on computing capacitance –Classify transmission lines - Regulation of short transmission lines – Percentage regulation of short transmission lines – Problems on computing Percentage regulation and Transmission efficiency of short transmission lines – Ferranti Effect – Corona.

UNIT 5 - Line structures for transmission and Distribution **Duration: 10 Periods (L:7.5 – T:2.5)**

Components of Overhead lines – factors affecting conductors spacing and ground clearance - Sag-derivation- Factors affecting sag, Problems on calculating sag - Disadvantages of loose span – Insulators - Requirements of insulators - Types of Insulators – Advantages of Polymer insulators - Voltage distribution across string of suspension Insulators- string efficiency- Problems on string efficiency - Methods of improving string efficiency.

UNIT 6 – Distribution Systems

Duration: 10 Periods (L:7.5 – T:2.5)

Definition of substation-need of substation- classification of sub-stations - Relative merits of indoor and outdoor sub-stations –Purpose of various equipment in sub-station - Classification of Distribution systems - steps to calculate the voltage drop in 1-phase A.C. distributors – problems – Micro Grid - Concept of smart GRID

Recommended Books

1. S.L.Uppal-Electrical Power
2. Soni,Guptha,Bhatnagar-Electrical Power Systems - DhanpatRai& Sons
3. A.T.Starr -Generation, Transmission and Utilisation
4. C.L.Wadhwa -Electrical Power Systems - New age international(P) limited
5. NEDCAP -Non Conventional Energy Guide Lines
6. J B Guptha -Electrical power plants
7. G.D. Roy Non conventional energy sources
8. CL Wadhwa -Electrical power Systems - New Age International(P) limited.
9. KR Padiyar - HVDC Power Transmission system Technology
10. S.N. Singh -Electrical Power generation, transmission and distribution.

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 List different sources of energy
- 1.2 Classify the sources of energy into conventional and non-conventional types.
- 1.3 State the necessity of developing non-conventional methods of power generation.
- 1.4 State the relative merits and limitations of Conventional and Non-Conventional types of sources.
- 1.5 State the method of generating electrical energy from Solar Power
- 1.6 State the method of generating electrical energy from Tidal Power
- 1.7 State the method of generating electrical energy from Wind power
- 1.8 State the method of generating electrical energy from Biomass
- 1.9 State the method of generating electrical energy from Geo Thermal Power
- 1.10 State the working principle of thermal power stations.
- 1.11 List the requirements for setting up of Thermal Power Station.

- 1.12 Draw the detailed line diagram of a condensing type thermal power station.
- 1.13 Explain the principle of working of each component of thermal power station.
- 1.14 Define Pulverization.
- 1.15 Mention the advantages of Pulverization
- 1.16 Define Condensation
- 1.17 Mention the advantages of Condensation
- 1.18 State the necessity of cooling towers in thermal power plant
- 1.19 List the types of cooling towers used in thermal power plants.

- 2.1 State the principle of working of Hydro power station.
- 2.2 Mention the requirement and factors for site selection of Hydro Electric Power station.
- 2.3 Define Hydrograph.
- 2.4 Classify the Hydro Electric Power stations based upon head.
- 2.5 Classify the Hydro Electric Power stations based upon nature of load
- 2.6 Classify the Hydro Electric Power stations based upon location
- 2.7 Classify the Hydro Electric Power stations based upon hydraulic considerations.
- 2.8 Explain the working of High Head Power Station with layout diagram.
- 2.9 Explain the working of Medium Head Power Station with layout diagram.
- 2.10 Explain the working of low Head Power Station with layout diagram.
- 2.11 State the need of Surge Tank.
- 2.12 State the need of Forebay.
- 2.13 State the need of Spill gates.
- 2.14 State the importance of nuclear energy.
- 2.15 Explain nuclear Fission.
- 2.16 Explain nuclear Fusion.
- 2.17 State the merits and demerits of nuclear energy
- 2.18 Mention the various nuclear fuels used in nuclear power station.
- 2.19 Explain the working of a Nuclear power station with a block diagram.
- 2.20 State the materials used for coolant used in Nuclear power station.
- 2.21 State the materials used for Reflector used in Nuclear power station.
- 2.22 State the materials used for control rods used in Nuclear power station.

- 3.1 State the need of transmission lines.
- 3.2 State the need of distribution lines.
- 3.3 Classify transmission systems.
- 3.4 State the advantages of D.C transmission systems.
- 3.5 State the advantages of A.C transmission systems.
- 3.6 State the advantages of Extra high voltage transmission systems.
- 3.7 Explain the effects of Supply frequency on Transmission lines.
- 3.8 Explain the effects of Supply voltage on Transmission lines.
- 3.9 State the effect of voltage on Line efficiency
- 3.10 State the effect of voltage on Voltage drop.
- 3.11 State the effect of voltage on Line loss.
- 3.12 State the effect of voltage on Active & reactive Power.
- 3.13 State the effect of voltage on Volume of conductor material.
- 3.14 Explain the concept of HVDC transmission.
- 3.15 List the types of HVDC transmission.
- 3.16 List the advantages of HVDC transmission.
- 3.17 List the disadvantages of HVDC transmission.

- 3.18 Explain the different types of conductors used in transmission line.
 - 3.19 List various effects due to which the current distribution in the conductor is distorted(Current distortion effects).
 - 3.20 State Skin effect
 - 3.21 State Proximity effect
 - 3.22 State Spirality effect
-
- 4.1 List various transmission line parameters.
 - 4.2 State the expression for inductance of 1 phase system (No derivation)
 - 4.3 Solve problems on inductance of 1 phase system
 - 4.4 State the expression for the inductance of 3 phase symmetrical round conductor.
(No derivation)
 - 4.5 Solve problems on the inductance of 3 phase symmetrical round conductor.
 - 4.6 State the expression for the inductance of 3 phase asymmetrically spaced round Conductors (No derivation)
 - 4.7 Solve problems on the inductance of 3 phase asymmetrically spaced round conductors
 - 4.8 State the expression for capacitance of 1 phase system (No derivation)
 - 4.9 Solve problems on capacitance of 1 phase system
 - 4.10 State the expression for the capacitance of 3 phase symmetrical round conductor.
(No derivation)
 - 4.11 Solve problems on the capacitance of 3 phase symmetrical round conductor.
 - 4.12 State the expression for the capacitance of 3 phase asymmetrically spaced round conductors (No derivation)
 - 4.13 Solve problems on the capacitance of 3 phase asymmetrically spaced round conductors
 - 4.14 Define Short transmission line.
 - 4.15 Define Medium transmission line.
 - 4.16 Define Long transmission line.
 - 4.17 Define Regulation.
 - 4.18 Define Percentage Regulation.
 - 4.19 State the approximate formula for percentage regulation.(no derivation)
 - 4.20 Compute the Sending end voltage for short transmission line
 - 4.21 Compute the Sending end Power factor for short transmission line
 - 4.22 Compute the Percentage Regulation for short transmission line
 - 4.23 Compute the Percentage transmission efficiency for short transmission line
 - 4.24 Draw the phasor diagram for short transmission line
 - 4.25 State 'Ferranti' effect
 - 4.26 Define Corona
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- 5.1 State the main components of overhead lines
 - 5.2 State the factors on which the conductor spacing and ground clearance depend
 - 5.3 Define 'Sag'
 - 5.4 State the factors affecting the sag
 - 5.5 Derive an equation for the approximate method of calculating sag when the supports are at the same level in still air.
 - 5.6 State the equation for the approximate method of calculating sag when the supports are at the same level with the effect of wind.
 - 5.7 State the equation for the approximate method of calculating sag when the supports are at the same level with the effect of ice.
 - 5.8 Solve the problems on calculating sag.

- 5.9 State the disadvantages of loose spans(sag more than prescribed value)
 - 5.10 State the purpose of insulators in transmission and distribution lines
 - 5.11 State the requirements of insulators.
 - 5.12 List various types of Insulators.
 - 5.13 State applications of the Pin type insulators.
 - 5.14 State applications of the Strain type insulators.
 - 5.15 State applications of the Suspension type insulators.
 - 5.16 State applications of the Shackle type insulators.
 - 5.17 Define a Polymer insulator.
 - 5.18 State the advantages of Polymer insulators.
 - 5.19 Derive the voltage across individual disc of a string insulator (upto 3 discs).
 - 5.20 Solve problems on distribution of voltage across string
 - 5.21 Define Flashover.
 - 5.22 Define Puncture.
 - 5.23 Define String-efficiency.
 - 5.24 State the methods of improving string efficiency
-
- 6.1 State the need and function of the substations.
 - 6.2 State the merits of indoor substation
 - 6.3 State the merits of outdoor substation
 - 6.4 State the relative merits of Gas insulated Substation over air insulated substation.
 - 6.5 List the equipment used in substation.
 - 6.6 State the purpose of the Bus bars.
 - 6.7 State the purpose of the Transformers.
 - 6.8 State the purpose of the Switch gear.
 - 6.9 State the purpose of the Indicating and Metering equipment
 - 6.10 State the purpose of the Protective relays
 - 6.11 State the purpose of the Lightning arrestors
 - 6.12 State the purpose of the Wave trap.
 - 6.13 Distinguish between primary distribution and secondary distribution.
 - 6.14 State the purpose of Feeder.
 - 6.15 State the purpose of Distributors.
 - 6.16 State the purpose of Service mains.
 - 6.17 Classify the type of distribution systems according to Type of current.
 - 6.18 Classify the type of distribution systems according to Construction.
 - 6.19 Classify the type of distribution systems according to Service.
 - 6.20 Classify the type of distribution systems according to Number of wire.
 - 6.21 Classify the type of distribution systems according to Scheme of connections.
 - 6.22 List the type of distribution systems.
 - 6.23 State the advantages and disadvantages of Radial system
 - 6.24 State the advantages and disadvantages of Ring main system.
 - 6.25 List the steps to calculate the voltage drop in 1-phase A.C. distributors
 - 6.26 Solve problems on voltage drop calculations in A.C. Distributors.
 - 6.27 Solve problems on voltage drop calculations in D.C Distributors.
 - 6.28 Define Micro Grid.
 - 6.29 Explain the concept of smart GRID

Suggested Student Activities

- 1 Student visits Library to refer to Electrical Manuals.
- 2 Student prepares the models of the power plants
- 3 Student visits Power generating stations familiarize with the equipment.
- 4 Visit Power nearby substations and gets familiar with the components.
- 5 Students may be asked to prepare model project of the power system.
- 6 Prepare charts on different Generating stations in our state mentioning their locations.
- 7 Gather information of HVDC transmission projects in India and prepare a report
- 8 Identify different insulators in your surroundings and prepare a report
- 9 Watch You tube videos on SMART GRID and MICRO GRID and prepare a summary report
- 10 Group discussion.
- 11 Surprise tests and 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	-	3	-	-	3	2	2	-	-	3	2,5,6,7,10
CO2	-	3	-	-	3	2	2	-	-	3	2,5,6,7,10
CO3	-	3	-	-	3	-	-	-	-	3	2,5,10
CO4	3	3	-	-	3	-	-	-	-	3	1,2,5,10
CO5	3	3	-	-	3	-	1	-	-	3	1,2,5,7,10
CO6	3	3	-	-	3	1	2	-	-	3	1,2,5,6,7,10

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-402C
ELECTRICAL POWER SYSTEMS
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. List the various sources of Energy .
2. List the types of cooling towers used in Thermal power plant
3. Define Hydrograph
4. State the need of Spill gates

PART - B

Marks: 2 x 3 = 6

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

5a) State the need of Non-conventional Energy Sources

OR

5 b) What is Coal Pulverisation?

6 a) State the importance of nuclear energy

OR

6 b) Write the merits of Nuclear Energy.

PART - C

Marks: 2 x 5= 10

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

7 a) Draw a single line diagram of a Thermal Power station

OR

7 b) State the relative merits and limitations of Conventional and Non-Conventional types of sources

8 a) Explain the principle of working of Hydro power station.

OR

8 b) Explain the working of High Head Power Station with layout diagram

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

SUB CODE: 18EE-402C
ELECTRICAL POWER SYSTEMS
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. State the need of transmission lines.
2. List the types of HVDC transmission
3. List various transmission line parameters
4. Define Medium transmission line

PART - B

Marks: 2 x 3 = 6

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

5a) State the advantages of Extra high voltage transmission systems.

OR

5 b) State Skin effect

6 a) State 'Ferranti' effect

OR

6 b) Define Percentage Regulation.

PART - C

Marks: 2 x 5= 10

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

7 a) Explain the different types of conductors used in transmission line.

OR

7 b) Explain the concept of HVDC transmission.

8 a) A 3-phase overhead line conductors are arranged in a horizontal plane and are 3 m apart. The diameter of each conductor is 1cm. Calculate the capacitance per km of each conductor

OR

8 b) A single phase transmission line has a resistance of 0.20 ohms and an inductive

reactance of 0.40 ohm. Find the voltage at the sending end to give 500KVA at 2kV at the receiving end at load power factor of 0.707 lagging

18EE-402C

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

SUB CODE: 18EE-402C
ELECTRICAL POWER SYSTEMS
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. Define Hydrograph.
2. List the types of HVDC transmission.
- 3 .Define `sag'
4. List the transmission line parameters.
5. Define Flashover.
6. Define a Polymer insulator.
7. State the need for substations.
8. State the purpose of Feeder.

PART - B

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

Marks: 4 X 3 = 12

9a) State the relative merits and limitations of Conventional and Non-Conventional types of sources

OR

9 b) State the requirements of insulators

10a) State the expression for the inductance of 3 phase symmetrical round conductor.

OR

10b) State the purpose of the Lightning arrestors

11a) State the purpose of insulators in transmission and distribution lines

OR

11b) State the disadvantages of loose spans.

12 a) State the purpose of the Indicating and Metering equipment

OR

- b) Distinguish between primary distribution and secondary distribution

PART - C

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

Marks: 4 X 5 = 20

- 13a) Explain the principle of working of each component of thermal power station.

OR

- 13 (b) State the requirements of insulators and give the list of insulators

- 14 a) A single phase transmission line has a resistance of 0.20 ohms and an inductive reactance of 0.40 ohm. Find the voltage at the sending end to give 500KVA at 2kV at the receiving end at load power factor of 0.707 lagging

OR

- 14 b) Explain the concept of smart GRID

- 15a) Derive an equation for the approximate method of calculating sag when the supports are at the same level with the effect of ice

OR

- 15 b) An insulator string consists of 3 units each having a safe working voltage of 15kV. The ratio of self-capacitive to shunt capacitive of each unit is 8 : 1. Find the maximum safe working voltage of the string and string efficiency

- 16a) Explain Feeder, distributors and service mains

OR

- 16 b) A single phase a.c distributor AB 300 meters long is fed from end A and is loaded as under
(a) 100 Amps at 0.707 p.f lagging 200 meters from point A
(b) 200 amps at 0.8 p.f lagging 300 meters from point A. The total resistance and the reactance of the distributor is 0.2 ohms and 0.1 ohms per km respectively. Calculate the total voltage drop in the distributor. The load power factors refer to the voltage at the far end.

AC MACHINES

Course Title	: AC Machines	Course Code	: 18EE-403C
Semester	: IV semester	Course Group	: Core
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

Pre requisites

This course requires the basic knowledge of electromagnetic circuits, and physical forces induced in conductors.

Course Outcomes

CO1 :	Describe the construction and working of single phase transformer
CO2 :	Determine the Equivalent circuit parameters of a single phase transformer
CO3 :	Evaluate the performance of single phase transformers
CO4 :	Describe the construction of three phase transformers and their applications
CO5 :	Analyze the behavior of alternators
CO6 :	Evaluate the performance of alternators

Blue Print of Marks for SEE

Unit No	Unit Name	Periods	Questions to be set for SEE				
			R		U	A	
1	Fundamentals of single phase transformers	8	Q4	Q1	Q9(a)	Q13(a)	
2	Tests on single phase transformer	12					
3	Performance of single phase transformers	10		Q2	Q10(a)	Q14(a)	
4	Three phase transformers	10					
5	Fundamentals of Alternators	12		Q3	Q5,Q6	Q9(b), Q11(a), Q11(b)	Q13(b), Q15(a), Q15(b)
6	Performance of alternators	8					
Total		60	8		8	8	

Course Content

UNIT 1 : Fundamentals of single phase Transformer

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

Introduction to transformer-Classifications of transformers,-Construction of transformers-Theory of an ideal transformer –EMF equation derivation –Problems on calculation of EMF-Transformer ratio-Special transformers- expression for copper saving –applications

UNIT 2 :Tests on single phase transformers

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

Working of Transformer on no load – Vector Diagram –Working of Transformer on load – Vector Diagram-Equivalent circuit of transformer-Short circuit test-Open circuit test-Determination of Equivalent circuit parameters-Problems – Sumpner's test

UNIT 3: Performance of single phase transformers

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

Regulation-Derivation of approximate equation for regulation based on vector diagram for lagging, leading, unity power factor loads – Numerical problems on regulation-Efficiency- condition for maximum efficiency – problems on efficiency-All day efficiency - Calculation for a given load cycle- problems on all day efficiency

UNIT 4: Three Phase Transformers

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

Three Phase Transformers-Construction-Different transformer configurations-Applications of different transformer configurations-parallel operation -Tap changing gear - NO load and ON load tap changing procedure-- Applications of three phase transformers-Special purpose transformers

UNIT 5: Fundamentals of Alternators

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

Alternators –Types of alternators – Brief description of parts with sketches and function of each part, construction- Specifications-Assembly - Exciter and pilot exciter - Stationary armature type construction - Advantages, Concentrated and distributed windings - short pitch and full pitch coils - Effect of chording and distribution factors - EMF equation - Derivation – Problems- phasor diagrams for unity, lagging and leading power factor loads – permanent magnet synchronous generator

UNIT 6: Performance of Alternators

Duration: 8 Periods (L: 6 – T: 2)

Regulation – Different methods of finding regulation- Calculation of regulation by synchronous impedance method- Necessity for parallel operation –Conditions to be fulfilled for Synchronization,- Synchronization by lamp methods – Procedure to connect a Diesel Engine generator to the supply mains –Load sharing – simple problems-Effect of change in excitation and input of an alternator connected to infinite bus.

Recommended Books

1. B.L. Theraja-Electrical Technology – Vol –II S.Chand& Co.
2. M.G Say –AC machines
3. P.S. Bhimbra–Electrical machines – Khanna Publishers
4. A.E. Fitzgerald, C. Kingsley and S. Umans Electrical machinery-McGraw Hill
5. MV Deshpande-Electric machines – Wheeler publishing.
6. BR Gupta and VandanaSinghal– Fundamentals of Electric machines

Suggested E-Learning references

1. <http://electrical4u.com/>
2. www.nptel.ac.in
3. <https://www.siemens.com/content/dam/internet/siemens-com/global/products-services>

Suggested Learning Outcomes

- 1.1 Define the word 'Transformer'
 - 1.2 Explain the working principle of single-phase transformer.
 - 1.3 Explain why the transformer cannot be operated on DC Supply
 - 1.4 Classify the transformers based on Number of phases
 - 1.5 Classify the transformers based on Construction
 - 1.6 Classify the transformers based on Function
 - 1.7 Explain the constructional details of transformers.
 - 1.8 State the purpose and function of each part of the transformer with legible sketch.
 - 1.9 Explain about core type transformer
 - 1.10 Explain about the shell type transformer.
 - 1.11 Distinguish between core type and shell type transformers.
 - 1.12 Define an Ideal Transformer
 - 1.13 Derive the E.M.F equation of a single phase transformer.
 - 1.14 Solve problems on EMF equation
 - 1.15 Define Turns Ratio in transformer
 - 1.16 Define Voltage transformation Ratio in transformer
 - 1.17 Define Current transformation Ratio in transformer
 - 1.18 List the special transformers used in industry.
 - 1.19 Define an Auto transformer
 - 1.20 Derive the expression for "saving of copper" in auto transformer
 - 1.21 State the advantages of autotransformers
 - 1.22 State the disadvantages of autotransformers
 - 1.23 List the applications of transformers
-
- 2.1 Explain working of transformer at No-Load with the help of its vector diagram.
 - 2.2 Explain working of transformer at Load with the help of vector diagram for Unity power factor
 - 2.3 Explain working of transformer at Load with the help of vector diagram for Lagging power factor
 - 2.4 Explain working of transformer at Load with the help of vector diagram for Leading power factor
 - 2.5 State the losses taking place in a transformer.
 - 2.6 State the effects of resistance and leakage reactance of primary and secondary windings.
 - 2.7 State the significance of air gap
 - 2.8 Draw the equivalent circuit of a transformer by approximation
 - 2.9 Draw the approximate equivalent circuit of a transformer referred to Primary
 - 2.10 Draw the approximate equivalent circuit of a transformer referred to Secondary
 - 2.11 Explain the procedure to find equivalent circuit parameters from No-load test and short circuit test on single phase transformer
 - 2.12 Solve the Problems on equivalent circuit parameters of a single phase transformer
 - 2.13 Explain the procedure of conducting polarity test on single-phase transformer.
 - 2.14 Explain the procedure of conducting Sumpner's test on a transformer

2.15 State the necessity of break down voltage test on transformer oil.

- 3.1. Define Regulation.
- 3.2. Derive the approximate equation of regulation for transformer.
- 3.3. Solve the problems to calculate the regulation of a single phase transformer for loads with unity power factor.
- 3.4. Determine the regulation of a single phase transformer for loads with lagging power factor
- 3.5. Calculate the regulation of a single phase transformer for loads with leading power factor.
- 3.6. State the reason for using the unit KVA for the transformer rating
- 3.7. Derive the expression for efficiency of a single phase transformer
- 3.8. Find the condition for maximum efficiency of a single phase transformer
- 3.9. Compute numerical problems for calculating the efficiency of the transformer
- 3.10. Define All Day Efficiency
- 3.11. State the method of calculating the all day efficiency for a given load cycle.
- 3.12. Solve numerical problems for calculating all day efficiency
- 3.13. Define Distribution transformer
- 3.14. Define Power Transformer
- 3.15. Differentiate between distribution transformer and power transformer.
- 3.16. Mention the reasons for failures of a transformer
- 3.17. State the reasons for humming noise near a transformer.
- 3.18. List the methods to reduce the noise level.

- 4.1. State the advantages of 3 phase transformer over single phase transformer
- 4.2. List the different types of three phase transformers by giving their symbolic representation and voltage relationships.
- 4.3. State the applications of star-star transformer
- 4.4. Mention the applications of delta-star transformers
- 4.5. List the applications of star-delta transformers
- 4.6. State the applications of delta-delta transformers
- 4.7. Mention the specifications of a transformer
- 4.8. State the benefits of using amorphous core in a transformer
- 4.9. State the need for parallel operation of transformer.
- 4.10. Mention the conditions for parallel operation of transformers.
- 4.11. State the necessity of cooling of power transformers.
- 4.12. Explain the methods of cooling of power transformer.
- 4.13. Draw a legible sketch of a power transformer
- 4.14. Explain the function of each part of a power transformer.
- 4.15. Explain the 'ON load' and 'OFF load' tap changing.
- 4.16. Explain the procedure for tap changing on load and no load tap changer
- 4.17. Mention the purpose of phase shifting transformer
- 4.18. State the purpose of a reactor transformer
- 4.19. Mention the purpose of HVDC Transformer
- 4.20. State the purpose of traction transformer
- 4.21. Mention the purpose of Isolation Transformers

- 5.1. Explain the Principle of working of Alternators
- 5.2. Describe the constructional details of Alternators with legible sketch.
- 5.3. Classify the alternators based on rotor construction

- 5.4. Explain the construction and working of Cylindrical rotor alternator
- 5.5. Explain the construction and working of salient pole rotor alternator
- 5.6. State the specifications of an alternator
- 5.7. State the advantage of Stationary Armature.
- 5.8. List the main parts of alternator
- 5.9. Mention the materials used for different parts of an alternator
- 5.10. Derive the expression for Chording factor
- 5.11. State the effect of chording factor
- 5.12. Derive the expression for Distribution factor
- 5.13. State the effect of Distribution factor
- 5.14. Derive EMF equation of an alternator taking into account distribution factor and pitch factor.
- 5.15. Solve simple problems on EMF equation
- 5.16. State the need of exciter in an Alternator.
- 5.17. List the various types of exciters
- 5.18. Explain armature reaction of Alternator at different power factors
- 5.19. State the reasons for voltage variations on Load.
- 5.20. Define the term synchronous impedance.
- 5.21. State the effects of synchronous impedance on the operation of the Alternator
- 5.22. Draw the equivalent circuit representing armature resistance, leakage reactance and armature reaction reactance
- 5.23. Obtain the relation between No load EMF and terminal voltage in Alternator.
- 5.24. Draw the vector diagram for No load EMF in alternator at different load power factors
- 5.25. Describe the construction and working of permanent magnet synchronous generator
- 5.26. List the applications of Permanent magnet synchronous generator

- 6.1. Define Voltage regulation of an alternator.
- 6.2. List the different methods of determining the voltage regulation of alternator.
- 6.3. Calculate the regulation by synchronous impedance method.
- 6.4. State the expressions for No load emf of alternator at different power factors
- 6.5. Solve problems on Synchronous impedance method.
- 6.6. Explain the necessity for parallel operation of three phase alternators
- 6.7. Define synchronization of alternators
- 6.8. State the conditions for synchronization of three phase alternator
- 6.9. List the methods of synchronization of alternators
- 6.10. Explain synchronization of alternators by using Dark and Bright lamp method
- 6.11. Explain synchronization of alternators by using Synchroscope method
- 6.12. Describe the procedure to connect a Diesel Engine generator to the supply mains
- 6.13. Explain the method to adjust the load shared by two alternators (or one alternator with Infinite bus bar) operating in parallel.
- 6.14. Explain the effect of change in input and excitation of an alternator connected to infinite bus.
- 6.15. Solve problems on load sharing of alternators in parallel operation

Suggested Student Activities

- 1 Prepare charts on types of transformers clearly labeling the parts.
- 2 Visit nearby transformer in your surroundings and prepare a report on the observations made during visit along with photos.

- 3 Visit the transformer manufacturing unit and prepare a report
- 4 Prepare a report on different transformers available in your Institute.
- 5 Do the maintenance of 50MVA transformer
- 6 Make charts of various transformer configurations
- 7 Quiz
- 8 Group discussion
- 9 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	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	
CO1	2	3	-	-	1	-	-	-	-	3	1, 2, 5,10
CO2	2	3	-	-	1	-	2	-	-	3	1,2, 5, 7, 10
CO3	3	3	-	-	-	-	2	-	-	3	1, 2, 7,10
CO4	-	3	-	-	1	-	-	-	-	3	2, 5, 10
CO5	3	3	-	-	1	-	-	-	-	3	1, 2, 5,10
CO6	3	3	-	-	2	-	2	-	-	3	1,2, 5, 7, 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
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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-403C

A.C MACHINES

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 Transformer.
2. Define Turns Ratio in transformer
3. Draw the vector diagram of a transformer on NO load
4. List the losses taking place in a transformer

PART - B

Marks: 2 x 3 = 6

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

5a) A single phase transformer has 400 turns on the primary winding and 1000 turns on the secondary winding. If it is operating at 50Hz supply with a maximum flux of 0.045wb find (i) the primary and secondary induced emf

OR

- 5 b) What are the advantages of an Auto transformer
- 6 a) Draw the equivalent circuit of a transformer by approximation

OR

- 6 b) State the significance of airgap

PART - C

Marks: 2 x 5= 10

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

- 7 a) Distinguish between core type and shell type transformers.

OR

- 7 b) Explain the function of each part of the transformer .
- 8 a) Explain working of transformer at Load with the help of vector diagram for Unity power factor

OR

- 8 b) The resistances and leakage reactance's of a 30 kVA, 2400 V/240 V distribution transformer are $R_1 = 0.68 \, \Omega$; $R_2 = 0.0068 \, \Omega$; $X_{l_1} = 7.8 \, \Omega$; $X_{l_2} = 0.0780 \, \Omega$;
Where subscript 1 denotes the 2400 V winding and subscript 2 denotes the 240 V winding.
Each quantity is referred to its own side of the transformer. Draw the equivalent circuit referred to High Voltage side

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

SUB CODE: 18EE-403C

A.C MACHINES

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. Define Regulation
2. Define All Day Efficiency
3. State the applications of star-star transformer
4. State the necessity of cooling of power transformers

PART - B

Marks: 2 x 3 = 6

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

- 5a) State the reason for using the unit KVA for the transformer rating

OR

- 5 b) State the reasons for humming noise near a transformer
- 6 a) State the advantages of 3 phase transformer over bank of three single phase transformers

OR

- 6 b) State the need for parallel operation of a transformer

PART - C

Marks: 2 x 5= 10

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

- 7a) Differentiate between distribution transformer and power transformer.

OR

7 b) A 500KVA ,6000/400 V ,1- ϕ transformer has a primary and secondary winding resistances of 0.4Ω and 0.0015Ω respectively. The Iron losses are 3.2KW ,Calculate the efficiency of transformer on full load assuming the p.f of the load to be 0.8 lagging

- 8 a) Explain the OFF load tap changing method on a transformer

OR

- 8 b) Explain the methods of cooling of power transformer.

18EE-403C

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

SUB CODE: 18EE-403C

A.C MACHINES

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 applications of transformers
2. Define Regulation
3. List the main parts of alternator
4. State the need for parallel operation of a transformer
5. State the specifications of an alternator
6. List the types of exciters
7. Define regulation of an alternator.
8. List the different methods of finding the regulation of alternator

PART - B

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

Marks: 4 X 3 = 12

9a) State the losses taking place in a transformer

OR

9b) Calculate the e.m.f induced per phase in a 3- ϕ , 8-pole, 50 Hz star connected alternator. The stator has 160 slots and 6 conductors per slot. Assume $K_p=1$ and $K_d=0.96$. The flux per pole is 0.16 wb

10a) State the advantages of three phase transformers over bank of three single phase transformers

OR

10b) Explain the effect of change in input and excitation of an alternator connected to infinite bus

11a) Classify the alternators based on rotor construction

OR

11b) State the advantage of Stationary Armature.

12a) State the conditions for synchronization for three phase alternator

OR

12 b) Explain the necessity for parallel operation of three phase alternators

PART - C

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

Marks: 4 X 5 = 20

13a) Derive the E.M.F equation of a single phase transformer.

OR

13 (b) Derive the expression for Chording factor

14 a) Explain the function of each part of a power transformer

OR

14b) Two alternators working in parallel have induced *emf's* on open circuit of $230\angle 0^\circ$ and $230\angle 10^\circ$ and having reactances of $j2\ \Omega$ and $j3\ \Omega$ respectively. Calculate
a. Terminal voltage
b. Power delivered by each of the alternators to a resistive load of $6\ \Omega$.
Neglect alternator resistances

15a) Obtain the relation between No load EMF and terminal voltage in Alternator at leading power factor.

OR

15 b. Explain armature reaction of Alternator at different power factors

16a) Explain the procedure of synchronising of alternators by using synchroscope method

OR

16 b) A 200 kVA, 415 V, 50 Hz, 3- ϕ alternator has effective armature resistance of $0.01\ \Omega$ and an armature leakage reactance of $0.05\ \Omega$. Compute the voltage induced in the armature winding when the alternator is delivering rated current at a load *pf* of 0.8 lag and 0.8 lead

GENERAL MECHANICAL ENGINEERING

Course Title	: General Mechanical Engineering	Course Code	: 18EE-404C
Semester	: IV semester	Course Group	: Core
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

Pre requisites

This course requires the basic knowledge of basic sciences at secondary school level

Course Outcomes

CO1	Solve simple problems on stresses, strains
CO2	Solve simple problems on torsion of shafts
CO3	Explain the Construction and working of IC Engines.
CO4	Describe the working of Boilers
CO5	Describe the construction and working of Turbines
CO6	Compare various types of Pumps

Blue Print of Marks for SEE

Unit No	Unit Name	Periods	Questions to be set for SEE				
			R		U	A	
1	Simple Stresses & Strains	10	Q4	Q1		Q9(a)	Q13(a)
2	Torsion of Shafts	10					
3	I.C Engines	12		Q2		Q10(a)	Q14(a)
4	Boilers	8					
5	Turbines	10		Q3	Q5,Q6	Q9(b), Q11(a), Q11(b)	Q13(b), Q15(a), Q15(b)
6	Pumps & Lubricants	10					
Total		60	8		8	8	

Course Content

UNIT-1 Simple Stresses & Strains

Duration: Periods 10(L: 8 – T:2)

Stress – strain - Poisson's ratio - elastic limit - statement of Hooke's law - stress-strain diagram with salient features for ductile materials under tensile stress - Elastic moduli - Young's modulus - Modulus of rigidity, - Bulk modulus - Working stress - Ultimate stress - Factor of safety. Simple problems

UNIT-2 Torsion in Shafts

Duration: Periods 10(L: 8 – T: 2)

Classification of shafts - Function of shafts - Polar moment of inertia of shafts - Torsion equation, maximum torque - power transmitted by the shaft - design of shaft based on strength and rigidity - Simple problems on shafts.

UNIT-3 I.C Engines

Duration: Periods 12 (L: 9 – T: 3)

I.C Engines - classification of heat engines and I.C engines - Comparison between petrol and diesel engine - Functions of carburetor, fuel injection pump, governing of I.C engines.

UNIT-4 Boilers**Duration: Periods 8 (L:6– T: 2)**

Boilers - Classification of boilers - Boiler mountings- Boiler accessories, modern high pressure boilers.

UNIT-5 Turbines**Duration: Periods 10(L: 7.5 – T: 2.5)**

Steam turbines - comparison between impulse and reaction turbines compounding of steam turbines – Hydraulic turbines - classification of hydraulic turbines – working principle of impulse and reaction turbines.

UNIT-6 Pumps & Lubricants**Duration: Periods 10 (L: 7.5 – T: 2.5)**

Hydraulic pumps – classification - comparison between various pumps -lubricants - properties, types, examples and their applications

Recommended Books

1. Strength of materials by Ramamrutham
2. Strength of materials by ZakaraiaBaig
2. Strength of materials by Surender Singh
3. Strength of materials by S.B.Junarker
4. General Mechanical Engineering by Lakshminarayana
5. General Mechanical Engineering by GopalaKrishna
6. Hydraulic Machinery by Jagadishlal
7. Strength of Materials by R.S. Kurmi

Suggested E-Learning references

1. www.learnengineering.org
2. www.nptel.ac.in
3. www.onlinestudies.com

Suggested Learning Outcomes

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

- 1.1. Define stress
- 1.2. Define strain
- 1.3. Mention the different types of stresses.
- 1.4. Mention the different types of strains.
- 1.5. State Hooke's law
- 1.6. Define Modulus of elasticity
- 1.7. Draw typical stress-strain curve for an M S Specimen under tension
- 1.8. Define factor of safety
- 1.9. Define Poisson's ratio

- 1.10. State the relationship between elastic constants.
- 1.11. Calculate the dimensional changes in the bodies of uniform circular cross section subjected to tensile and compressive forces
- 1.12. Solve simple problems on Stress.
- 1.13. Solve simple problems on Strain.
- 1.14. Solve simple problems on Poisson's ratio.
- 1.15. Solve simple problems on calculation of the dimensional changes in the bodies of uniform circular cross section subjected to tensile and compressive forces.

- 2.1. State the function of shafts.
- 2.2. Classify shafts.
- 2.3. Specify the standard sizes of shafts.
- 2.4. Define Polar moment of inertia
- 2.5. Give the expression for Polar moment of inertia of solid shaft.
- 2.6. Give the expression for Polar moment of inertia of hollow shaft.
- 2.7. Explain the terms involved in simple torsion equation.
- 2.8. Maximum torque transmitted and power transmitted.
- 2.9. Design the size of solid shaft-Strength point of view and stiffness point of view
- 2.10. Simple problems.

- 3.1. Define I.C. Engine.
- 3.2. Classify heat engine.
- 3.3. Mention types of I.C engines.
- 3.4. Explain the construction of I.C. Engines.
- 3.5. Identify the various parts of Diesel engine and Petrol engine.
- 3.6. Explain the principle of 4-stroke diesel engine.
- 3.7. Explain the principle of 4-stroke petrol engine.
- 3.8. Explain the principle of 2-stroke diesel engine.
- 3.9. Explain the principle of 2-stroke petrol engine.
- 3.10. Distinguish between 4-stroke cycle and 2-stroke cycles.
- 3.11. Distinguish between diesel engine and petrol engine.
- 3.12. State the function of carburettor.
- 3.13. State the functions of fuel pump.
- 3.14. State the functions of Governor.

- 4.1. Explain the function of a boiler.
- 4.2. Classification of boilers.
- 4.3. Compare fire tube boiler with water tube boiler.
- 4.4. Explain construction and working principle of simple vertical boiler.
- 4.5. Describe construction and working principle of Cochran boiler.
- 4.6. Explain construction and working principle of Lancashire boiler.
- 4.7. Describe construction and working principle of Babcock and Wilcox boiler.
- 4.8. Explain construction and working principle of Benson boiler
- 4.9. Describe Lamont boiler with a neat sketch.
- 4.10. List different mountings of a boiler.
- 4.11. Mention the necessity of Water level indicator
- 4.12. Write the necessity of Pressure gauge.
- 4.13. State the necessity of Stop valve

- 4.14. Mention the necessity of Feed check valve.
- 4.15. Write the necessity of Safety valve.
- 4.16. State the necessity of Fusible plug.
- 4.17. Explain the working principle of Super heater.
- 4.18. Describe the working principle of Super heater.
- 4.19. Explain the working principle of Air pre heater.

- 5.1. Define turbine.
- 5.2. Explain the principle of working of a steam turbine.
- 5.3. Classify the turbine based on action of steam.
- 5.4. Explain the working principle of impulse turbine
- 5.5. Explain the working principle of Reaction turbine
- 5.6. Compare impulse turbine with reaction turbine.
- 5.7. Describe the working principle of the De Level and Parson's reaction turbines.
- 5.8. Compounding of steam turbines and types (Velocity, Pressure and combined)
- 5.9. Classify the water turbines.
- 5.10. Explain the construction and working of Pelton wheel.
- 5.11. Explain the construction and working of Francis turbine
- 5.12. Explain the construction and working of Kaplan turbine
- 5.13. Compare Pelton wheel, Francis turbine and Kaplan turbine

- 6.1. Define Pump
- 6.2. Differences between a centrifugal pump and a reciprocating pump
- 6.3. Explain the principle of operation of centrifugal pump.
- 6.4. Explain the constructional details of centrifugal pump.
- 6.5. Describe working principle and construction of double stage reciprocating pump.
- 6.6. Explain the principle of jet pump and submersible pump.
- 6.7. State the purpose of lubrication.
- 6.8. State the properties of a lubricant
- 6.9. List the types of lubricants with examples.
- 6.10. Mention the application of lubricants.

Suggested Student Activities

1. Prepare a chart for the various Formulae used.
2. Draw the constructional features of an I.C Engine, types of turbines and pumps.
3. Sketch the layout of a steam generation plant.
4. Quiz
5. A visit to nearby power plant station to identify motors, pumps.

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	-	-	-	-	3	1,2,5,10
CO2	2	3	-	-	3	-	-	-	-	3	1,2,5,10
CO3	-	3	-	-	3	1	-	-	-	3	2,5,6,10
CO4	-	3	-	-	3	1	-	-	-	3	2,5,6,10
CO5	-	3	-	-	3	1	-	-	-	3	2,5,6,10
CO6	-	3	-	-	3	-	-	-	-	3	2,5,10

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					
Total Questions	8			8	8

State Board of Technical Education and Training, Telangana
Model Question paper
DEEE IV semester Mid Semester-I Examination

Corse Code: 18EE-404C
Course Name: General Mechanical Engineering

Duration: 1 hour
Max. Marks: 20

PART-A

Answer **all** questions, Each Question carries one mark

4x1 = 4 Marks

1. State Hooke's law
2. Define Poisson's ratio
3. State the function of shafts
4. Give the expression for Polar moment of inertia of solid shaft

PART-B

Answer **two** questions. Each question carries three marks

2x 3 = 6 Marks

5. a) Define factor of safety

OR

- b) Define Modulus of elasticity

6. a) Classify shafts.

OR

- b) Give the expression for Polar moment of inertia of hollow shaft.

PART-C

Answer **two** questions. Each question carries five marks

2x 5 = 10 Marks

7. a) State the relationship between elastic constants

OR

- b) Draw typical stress-strain curve for an M S Specimen under tension.

8. a) Explain the terms involved in simple torsion equation.

OR

- b) Design the size of solid shaft from strength point of view.

State Board of Technical Education and Training, Telangana
Model Question paper
DEEE IV semester Mid Semester-II Examination

Corse Code: 18EE-404C
Course Name: General Mechanical Engineering

Duration: 1 hour
Max. Marks: 20

PART-A

Answer **all** questions, Each Question carries one mark

4x1 = 4 Marks

1. Define I.C. Engine
2. State the functions of fuel pump in an IC engine
3. State the necessity of boiler water level indicator
4. State the function of superheater

PART-B

Answer **two** questions. Each question carries three marks

2x 3 = 6 Marks

5. a) Classify heat engine

OR

- b) State the functions of carburetor in an IC engine

6. a) Classify boilers.

OR

- b) Compare fire tube boilers and water tube boilers in any three aspects.

PART-C

Answer **two** questions. Each question carries five marks

2x 5 = 10 Marks

7. a) Explain the construction of I.C. Engines

OR

- b) Distinguish between diesel engine and petrol engine in any five aspects.

8. a) Explain the operation of Lamont boiler with a neat sketch.

OR

- b) Explain the operation of Benson boiler with a neat sketch.

State Board of Technical Education and Training, Telangana
Model Question paper
DEEE IV semester
Semester End Examination

Corse Code: 18EE-404C
Course Name: General Mechanical Engineering

Duration: 2 hours
Max.Marks: 40 Marks

PART-A

Answer **all** questions

8x1 = 8 Marks

- 1) State Hooke's law
- 2) State the function of economizer
- 3) State the purpose of lubrication
- 4) Define IC engine
- 5) Classify turbines based on action of steam
- 6) Classify water turbines
- 7) State the desirable properties of lubricants
- 8) List the types of lubricants

PART-B

Answer **four** questions

4 x 3 = 12 Marks

9 a) Mention different types of stresses

OR

9 b) Compare impulse turbine and reaction turbine in any three aspects.

10 a) State the function of speed governor in an IC engine.

OR

b) List the applications of lubricants.

11 a) Compare impulse turbine and reaction turbine in any three aspects.

OR

b) State the working principle of steam turbine.

12 a) Classify hydraulic turbines.

OR

b) Compare centrifugal pump and reciprocating pump in any three aspects.

PART - C

Instructions: (1) Answer the following questions

(2) Each question carries **five** marks.

Marks: 4 X 5 = 20

13 a) Draw typical stress-strain curve for an M S Specimen under tension

OR

b) Explain the working of Parson's reaction turbine with a neat sketch.

14 a) Explain the working of four stroke diesel engine with a neat sketch.

OR

b) Explain the principle of operation of centrifugal pump.

15 a) Explain the working principle of Pelton wheel

OR

b) Explain the working principle of Kaplan turbine

16 a) Explain the principle of operation of jet pump.

OR

b) Distinguish between a centrifugal pump and a reciprocating pump in any five aspects.

DIGITAL ELECTRONICS

Course Title	: Digital Electronics	Course Code	: 18EE-405C
Semester	: IV semester	Course Group	: Elective
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

Pre requisites

The student should have a basic knowledge of Science and Mathematics in Secondary Education and knowledge of basics of Electrical Engineering and Analog Electronics.

Course Outcomes

CO1 :	Perform Data conversion between basic Numbering systems
CO2 :	Apply Boolean theorems to minimize digital circuits.
CO3 :	Design Combinational Logic circuits using logic gates.
CO4 :	Construct flip-flop circuits.
CO5 :	Construct counters and shift registers.
CO6 :	Perform A/D and D/A Conversion

Blue Print of Marks for SEE

Unit No	Unit Name	Periods	Questions to be set for SEE				
			R		U	A	
1	Number Systems	08	Q4	Q1		Q9(a)	Q13(a)
2	Boolean Algebra and Logic Gates	12					
3	Combinational circuits	12		Q2		Q10(a)	Q14(a)
4	Basics of Sequential Circuits	08					
5	Registers and Counters	12		Q3	Q5,Q6	Q9(b), Q11(a), Q11(b)	Q14(b), Q15(a), Q15(b)
6	A /D and D/A Converters	08					
Total		60	8		8	8	

Course Content

UNIT 1 – Number Systems

Duration: 08 Periods (L:6 - T:2)

Number systems - Binary operations - 1's Complement - 2's Complement – Conversion of one number system to another number system - Weighted and un-weighted Codes - Priority Bit

UNIT 2 - Boolean Algebra and Logic Gates

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

Boolean Algebra - Boolean Laws and Theorems - Basic Logic Gates - Concept of Duality - De-Morgan's Theorem - Universal Gates- ExOR gate – ExNor gate - Canonical and Standard Forms of Boolean Function - Simplification of Boolean expression upto 3 variables using Karnaugh's Maps - realizing simplified expression by Logic Gates.

UNIT 3 - Combinational Circuits

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

Combinational circuits - Half and Full Adders – Multiplexer - De-Multiplexer - Decoder - Encoders

UNIT 4 - Basics of Sequential Circuits

Duration: 08 Periods (L:6 - T: 2)

Sequential Circuits – Need of Clock - Triggering Types – Flip-flops - Asynchronous Inputs –555 Timer IC – Multivibrators.

UNIT 5 - Registers and Counters

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

Registers - Counters – Modulus of Counters -Asynchronous Counter (4-bit)- Synchronous Counter (4-bit)

UNIT 6 - A-to D and D-to A Converters

Duration: 08 Periods (L:6 - T: 2)

Analog and Digital signals - Analog to Digital converter – Digital to Analog converter – Specifications of ADC and DAC – Applications of ADC and DAC

Recommended Books

- 1 Digital Systems-principles and applications. Ronald J. Tocci, Neal S. Widmer, Gregory L. Moss, 10th edition
- 2 Digital Fundamentals by T. L. Floyd, Pearson International Publications, Ninth Edition, 2000.
- 3 Digital Computer Electronics by Malvino and Leach. 3rd edition Tata McGraw-Hill Education
- 4 Modern Digital Electronics by R P Jain, Tata McGraw-Hill Education, 2003.

Suggested E-Learning references

1. www.nptel.ac.in
2. <http://freevideolectures.com/Course/3164/Digital-Electronics>
3. <http://www.freebyte.com/electronics/>
4. <https://www.circuitlogix.com>
5. <http://www.vlab.co.in>
6. www.electronics-tutorials.ws
7. <http://www.allaboutcircuits.com>
8. <http://ocw.mit.edu/>

Suggested Learning Outcomes

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

- 1.1 List various Number systems with their radix.
- 1.2 Convert a given decimal number into Binary numbers.
- 1.3 Convert a given Binary number into decimal numbers.
- 1.4 Convert a given decimal number into Hexadecimal numbers.
- 1.5 Convert a given Hexadecimal number into decimal numbers.
- 1.6 Convert a given binary number into hexadecimal number system.
- 1.7 Convert a given hexadecimal number into binary number system.
- 1.8 Perform binary addition, subtraction and Multiplication.
- 1.9 Write 1's complement and 2's complement numbers for a given binary number.
- 1.10 Perform subtraction of binary numbers in 1's complement method.

- 1.11 Perform subtraction of binary numbers in 2's complement method.
- 1.12 Define weighted and Un-weighted codes
- 1.13 Write binary equivalent number for a number in BCD.
- 1.14 Convert binary number to equivalent BCD.
- 1.15 Compare Binary and BCD.
- 1.16 Write binary equivalent number for a number in Gray code
- 1.17 Convert binary number to Gray code.
- 1.18 State the specific applications of Gray code.
- 1.19 Write binary equivalent number for a number in Excess-3 code.
- 1.20 Convert binary number to Excess-3 code.
- 1.21 .State the importance of Parity Bit.

- 2.1 Define bit, byte and word.
- 2.2 Define Boolean Function and Truth table.
- 2.3 State the Boolean Postulates.
- 2.4 Define Basic gates AND, OR, NOT
- 2.5 Explain Basic gates AND, OR, NOT with output expression, symbol and truth Table.
- 2.6 Define Universal gates: NAND, NOR
- 2.7 Explain Universal gates: NAND, NOR with output expression, symbol and truth Table.
- 2.8 Define EX-OR Gate.
- 2.9 Explain EX-OR Gate with output expression, symbol and truth Table.
- 2.10 Define EX-NOR Gate.
- 2.11 Explain EX-NOR Gate with output expression, symbol and truth Table.
- 2.12 State De Morgan's Theorems
- 2.13 Draw the simplified logic diagram of given Boolean expression (upto 3 variables) using Boolean Postulates along with De Morgan's Theorems.
- 2.14 Write output expression of a given Logic Diagram along with truth table.
- 2.15 Realize Basic Gates using Universal Gates.
- 2.16 Realize EXOR gates using Universal Gates.
- 2.17 Realize EXNOR gates using Universal Gates.
- 2.18 Differentiate between Canonical and Standard forms of Boolean expression.
- 2.19 Convert a given Boolean expression in SOP forms.
- 2.20 Convert a given Boolean expression in POS forms.

2.21 Identify Pairs, Quads and Octets in Karnaugh's maps.

2.22 Draw the simplified logic diagram of given Boolean expression (upto 3 variables) using Karnaugh's Maps.

3.1 Define Combinational Circuit.

3.2 Develop the logical diagram of a Half-adder along with expression and Truth table output.

3.3 Develop the logical diagram of a Full-adder along with expression and Truth table output.

3.4 Realize Full-adder using Half-adder and basic gates.

3.5 Explain the operation of a 4-bit parallel adder developed using Full-Adder.

3.6 Define a Multiplexer.

3.7 Explain the working of 8:1 Multiplexer along with Truth table and Logical Diagram.

3.8 Realize Logic gates using suitable Multiplexer.

3.9 Realize SOP expressions (of 3 variables) using suitable Multiplexer.

3.10 Define a De-Multiplexer.

3.11 Explain the working of 1:8 De- Multiplexer along with Truth table and Logical Diagram.

3.12 Define a Decoder.

3.13 Explain the working of 3 to 8 Decoder along with Truth table and Logical Diagram.

3.14 Realize SOP expressions (of 3 variables) using suitable Decoder.

3.15 Define an Encoder.

3.16 Explain the working of Decimal to BCD encoder circuit.

4.1 Define a sequential Circuit.

4.2 Compare combinational and sequential circuits.

4.3 State the need for clock.

4.4 State the concept of Edge Triggering.

4.5 Define Level Triggering.

4.6 Explain the working of clocked R-S Flip-Flop (NAND gate implementation) with truth table.

4.7 Explain the working of clocked J-K Flip-Flop with truth table

4.8 Define Race-around condition.

4.9 Explain the Edge triggering method used to overcome Race-around condition.

4.10 Explain the Master Slave JK Flip Flop mentioning how it overcomes Race-around condition.

4.11 Explain the working of clocked D Flip-Flop with truth table.

- 4.12 Explain the working of clocked T Flip-Flop with truth table.
- 4.13 Realize D Flip flop using J-K Flip-Flop.
- 4.14 Realize T Flip flop using J-K Flip-Flop.
- 4.15 Mention the applications of Flip-Flops.
- 4.16 Define Asynchronous inputs.
- 4.17 State the need for Preset input.
- 4.18 State the need for Clear input.
- 4.19 Explain the internal block diagram of 555 Timer IC.
- 4.20 Define a Multivibrator.
- 4.21 Explain the working of Monostable multivibrator using 555 IC.
- 4.22 Explain the working of Astable multivibrator using 555 IC.
- 4.23 Explain the working of Bi-stable multivibrator using Flip-Flops.

- 5.1 State the need of a register
- 5.2 Classify Registers.
- 5.3 Explain the working of 4-bit shift left registers with a circuit and timing diagram.
- 5.4 Describe the working of 4-bit shift right registers with a circuit and timing diagram.
- 5.5 Explain the working of 3 bit Ring counter with a circuit and timing diagram.
- 5.6 Describe the working of a twisted ring counter developed by 3-bit ring counter with circuit and timing diagram.
- 5.7 Define a counter
- 5.8 Differentiate between counter and timer.
- 5.9 Define Modulus of a counter.
- 5.10 Explain the working of 4-bit Asynchronous Up counter with a circuit and timing diagram.
- 5.11 Describe the working of 4-bit Asynchronous Down counter with a circuit and timing diagram.
- 5.12 Explain the working of 4-bit Asynchronous Up-Down counter with a circuit and timing diagram.
- 5.13 Describe the working of Asynchronous decade counter with a circuit and timing diagram.
- 5.14 Explain the working of 4-bit Synchronous counter with a circuit and timing diagram.
- 5.15 Distinguish between Asynchronous and Synchronous counters.

- 6.1 Define Analog signal.
- 6.2 Define a Digital signal.

- 6.3 State the need for A/D conversion and D/A conversion.
- 6.4 State the basic principle of D/A conversion.
- 6.5 Define resolution.
- 6.6 Define Accuracy.
- 6.7 Define Monotonicity.
- 6.8 State the settling time of D/A converter.
- 6.9 Describe the working of 4-bit D/A converter using Binary weighted resistors.
- 6.10 Explain the working of 4-bit D/A converter using R-2R ladder network.
- 6.11 Describe the working of 3-bit Flash Type A/D Converter.
- 6.12 Explain the A/D conversion using successive approximate method.
- 6.13 Explain the working of Counter type A/D converter.
- 6.14 Identify the fastest A/D converter and justify.
- 6.15 Mention the applications of ADC.
- 6.16 State the applications of DAC.

Suggested Student Activities

- 1 Student identifies different digital devices used in day to day life by a common man at home.
- 2 Discuss about the drawbacks of digital devices like performance AC remotes at different temperatures etc.
- 3 Student reads a mini project from a magazine on a topic related to this course and presents a seminar to share the idea of it.
- 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	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	
CO1	3	2	-	-	-	-	-	-	-	3	1,2,10
CO2	-	3	-	-	2	-	-	2	-	3	2,5,8,10
CO3	-	3	-	-	3	-	-	2	-	3	2,5,8,10
CO4	-	3	-	-	3	-	-	-	-	3	2,5,10
CO5	-	3	-	-	3	-	-	-	-	3	2,5,10
CO6	-	3	-	-	3	-	-	-	-	3	2,5,10

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					
Total Questions	8			8	8

State Board of Technical Education and Training, Telangana
Model Question paper
DEEE IV Semester
Mid Semester-I Examination

Corse Code: 18EE-405C
Course Name: Digital Electronics

Duration: 1 Hour
Max.Marks: 20

PART-A

Answer **all** questions, Each Question carries *one* mark

4x1 = 4 Marks

- 1) Convert binary number $1001_{(2)}$ to Decimal.
- 2) Write the 1's compliment of $1001_{(2)}$.
- 3) Draw the symbol of two input AND gate.
- 4) List the Universal gates.

PART-B

Answer the following questions. Each question carries *three* marks

2x 3 = 6 Marks

- 5 a) Convert the following hexadecimal numbers into decimal equivalent B2F8.

(OR)

- 5 b) Define weighted and Un-weighted codes
6 a) Realize basic gates using NAND gate.

(OR)

- 6 b) State De-Morgan's laws.

PART-C

Answer the following questions. Each question carries *five* marks

2x5 = 10Marks

- 7a) State the Unique feature of Gray code and its application

(OR)

- 7 b) Perform binary subtraction of $100101_{(2)}$ from $110011_{(2)}$ using 2's complement method.

- 8 a) Define EX-OR and EX-NOR Gates and write their Truth Table, output expression and draw Symbol.

(OR)

- 8 b) Simplify Boolean expressions using K-map and draw the logic diagram.

$$f = \bar{A} \bar{B} C + A B C + A \bar{B} C + A B \bar{C}$$

State Board of Technical Education and Training, Telangana
Model Question paper
DEEE IV Semester
Mid Semester-II Examination

Corse Code: 18EE-405C
Course Name: Digital Electronics

Duration: 1 Hour
Max.Marks: 20

PART-A

Answer **all** questions, Each Question carries *one* mark

4x1 = 4 Marks

- 1) List any two combinational circuits.
- 2) Define Multiplexer.
- 3) Define sequential circuit.
- 4) List any two applications of flip-flops.

PART-B

Answer the following questions. Each question carries *three* marks

2x 3 = 6 Marks

5a) Develop the Truth table, output expression and logical diagram of a Half-adder.
(OR)

5b) Explain the working of 4:1 Multiplexer with Truth table .

6a) State the concept of Edge triggering.
(OR)

6 b) Define asynchronous inputs.

PART-C

Answer the following questions. Each question carries *five* marks

2x5 = 10Marks

7 a) Realize Full-adder using Half-adder and basic gates.
(OR)

7 b) Develop a 4-bit parallel adder using Full-Adder and explain its operation

8 a) Explain the working of clocked J-K flip-flop with truth table.
(OR)

8 b) Discuss the methods to overcome race around condition in J-K flip-flops.

State Board of Technical Education and Training, Telangana

Model Question paper

DEEE IV Semester

Semester End Examination

Corse Code: 18EE-405C

Course Name: Digital Electronics

Duration: 2 Hours

Maximum Marks: 40

PART-A

Answer all questions

8x1 = 8 Marks

- 1) Convert binary number 0111_2 to Decimal.
- 2) Write the truth table for an Half-adder.
- 3) List the different types of registers.
- 4) Draw the symbol of D-type Flip-Flop.
- 5) State the need for a Register.
- 6) Define Counter.
- 7) Define Analog Signal.
- 8) Define Resolution of a D/A converter.

PART-B

Answer the following questions

4x3= 12 Marks

- 9a) Subtract 11110_2 from 10101_2 by using 2's Compliment method.
(OR)
- 9b) Differentiate between Counters and Timers in three aspects.
- 10a) Define a Combinational Circuit.
(OR)
- 10b) State the need for A/D and D/A conversion.
- 11a) Draw the circuit of 4-bit shift left registers.
(OR)
- 11b) Differentiate between Synchronous and Asynchronous counters.
- 12a) State the basic principle of D/A conversion.
(OR)
- 12b) An 8-bit D/A convertor has a step size of 20mV. Determine the full-scale output and percentage resolution.

PART-C

Answer the following questions

4x 5=20 Marks

13a) Convert the following Boolean function into SOP and POS form

$$f(A,B,C) = A + A B C + A B$$

(OR)

13b) Explain the working of 4-bit Asynchronous Up counter with a circuit and timing diagram

14a) Explain the working of 8:1 Mux along with Truth table and Logical Diagram.

(OR)

14b) Explain the working of a 3-bit flash type ADC.

15a) Explain shifting data bit-by-bit in a 3-bit shift - right register with relevant diagram.

(OR)

15b) Explain the working of Three bit synchronous up counter with block diagram, truth table and timing diagram.

16a) Explain the working of Counter type A/D converter

(OR)

16b) Explain A/D conversion using successive approximate method.

ELECTRICAL ENGINEERING DRAWING PRACTICE

Course Title	: Electrical Engineering Drawing Practice	Course Code	: 18EE-406P
Semester	: IV semester	Course Group	: Practical
Teaching Scheme in Periods (L:T:P)	: 15:0:30	Credits	: 1.5
Methodology	: Lecture + Practice	Total Contact Periods	: 45 Periods
CIE (Continuous Internal Evaluation)	: 60 Marks	SEE (Semester End Examination)	: 40 Marks

Pre requisites

The student should have knowledge of Engg. Graphics, Construction of Electrical machines, Substations and Power System Equipments

Course Outcomes

CO1 :	Draw various Electrical symbols & fuses
CO2 :	Draw the sectional views of transformers
CO3 :	Draw the cross sectional view of different types of underground cables
CO4 :	Develop DC & AC machine windings.
CO5 :	Draw the line supports and layout of substations
CO6 :	Draw various Power system protection Equipment

Blue Print of Marks for SEE

Unit No	Unit Name	Periods	Questions to be set for SEE		
			R	U/A	
1	Electrical symbols & fuses	06	Q1	Q5(a)	
2	Transformers	09			
3	Underground Cables	06	Q2		
4	D.C & A.C windings	09			
5	Line Supports and Substations	06	Q3	Q5(b)	Q6(a)
6	Power System Protection Equipments	09	Q4		Q6(b)
Total		45	4	4	

Course Content

1. Electrical symbols & fuses

Duration: 6 Periods (L:2 - P:4)

Graphical Electrical symbols of different electrical devices - Views of fuses

2. Transformers

Duration: 9 Periods (L:3 - P:6)

Single- phase single stepped core type transformer - Core sections, sectional views, Three phase three stepped core type transformers- Core sections, sectional views.

3. Underground Cables

Duration: 6 Periods (L:2 - P:4)

Cross sectional views of single core, 2 core, 3 core, 3.5 core & 4 core cables, SL & H type cables.

4. DC & AC winding

Duration: 9 Periods (L:3 - P:6)

Simplex lap and wave winding for DC armature - Single layer lap and wave winding for 1-phase and 3- phase AC machines

5. Line Supports and Substations layout

Duration: 6 Periods (L:2 - P:4)

Supporting steel towers –Poles – Stays & Guys - single line diagram substations - Single line diagram of Grid connected Solar PV system

6. Power system Protection Equipment

Duration: 9 Periods (L:3 - P:6)

Lightning arrestors – Circuit breakers - Earthing

Recommended Books

1. “Electrical Engineering Drawing” by S.K.Bhattacharya, NewAge International Publishers
2. “Electrical Drafting” - S.F. DEVALAPUR EEPB
3. “Electrical Drawing” - K.L. NARANG

Suggested E-Learning references

1. www.nptel.ac.in
2. <https://www.academia.edu>
(https://www.academia.edu/26976158/ELECTRICAL_ENGINEERING_drawing_by_Dr._S._K_Bhattacharya.pdf)

Specific Learning Outcomes

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

- 1.1 Draw standard symbols of electrical components: Constant Resistor and variable Resistor, Constant Inductor and variable inductor, Constant capacitor and variable capacitor.
 - 1.2 Draw standard symbols of electrical sources and meters: DC Voltage Source, DC current source, Battery, Single phase AC voltage source, three phase AC voltage source, transformer, Ammeter, Voltmeter, Power factor meter and Wattmeter.
 - 1.3 Draw standard symbols of electrical accessories: One way Switch and two ways Switch, Normally Open & Normally Close Push buttons, Fuse, Circuit breaker, Isolators, Ground and Electrical Switchbox.
 - 1.4 Draw standard symbols of electrical fixtures: Wall mounted lamp fixture, Ceiling fan, Power vent fan, Fluorescent light fixture, Bell, Buzzer, Single and three phase Electric motors, Motor starter.
 - 1.5 Draw Sectional end view of Rewirable fuse.
 - 1.6 Draw Sectional Elevation of Rewirable fuse.
 - 1.7 Draw Sectional end view of HRC fuse.
-
- 2.1 Draw the cross section of single stepped core of one limb of transformer.

- 2.2 Draw the cross section of 2 stepped core of one limb of transformer.
- 2.3 Draw the cross section of 3 stepped core of one limb of transformer.
- 2.4 Draw sectional Plan of a single-phase single stepped core type Transformer from the given data.
- 2.5 Draw Elevation of a single-phase single stepped core type Transformer from the given data.
- 2.6 Draw sectional plan of a 3 phase three stepped core type transformers from the given data.
- 2.7 Draw sectional Elevation of a 3 phase three stepped core type transformers from the given data.

- 3.1 Draw the cross sectional view of single core cable.
- 3.2 Draw the cross sectional view of Two core cable.
- 3.3 Draw the cross sectional view of three core XLPE insulated armoured cable.
- 3.4 Draw the cross sectional view of 3.5 core XLPE insulated armoured cable.
- 3.5 Draw the cross sectional view of four core XLPE insulated armoured cable.
- 3.6 Draw the cross sectional view of H type cable.
- 3.7 Draw the cross sectional view of S.L type cable.

- 4.1 Develop winding diagram for a simplex Lap connected DC machine
- 4.2 Develop winding diagram for a simplex Wave connected DC machine
- 4.3 Develop winding diagram of a 1-phase single layer lap winding.
- 4.4 Develop winding diagram of a 1-phase single layer wave winding.
- 4.5 Develop winding diagram of a 3-phase single layer lap winding.
- 4.6 Develop winding diagram of a 3-phase single layer wave winding.

- 5.1 Draw the sketch of 132 KV steel tower of single circuit.
- 5.2 Draw the sketch of 132 KV steel tower of double circuit.
- 5.3 Draw the sketch of 220 KV steel towers of single circuit.
- 5.4 Draw the sketch of 220 KV steel towers of double circuit.
- 5.5 Draw the view of stranded steel wire guy marking all the accessories.
- 5.6 Draw the single line diagram of 33kV / 11kV substation.
- 5.7 Draw the single line diagram of 220KV/132 KV substation
- 5.8 Draw single line diagram of Grid connected solar PV system.
- 5.9 Draw the elevation of Plinth mounted substation.
- 5.10 Draw the elevation of Pole mounted substation.

- 6.1 Draw the dimensioned sketch of Pipe earthing.
- 6.2 Draw the dimensioned sketch of Plate earthing.
- 6.3 Draw the sketch of Expulsion type lightning arrester.
- 6.4 Draw the sketch of Thyrite type lightning arrester.
- 6.5 Draw the sketch of Metal oxide type lightning arrester.
- 6.6 Draw the sketch of Minimum oil circuit breaker with neat labelling.

- 6.7 Draw the sketch of Vacuum circuit breaker with neat labelling.
 6.8 Draw the sketch of SF6 circuit breaker with neat labelling.

Suggested Student Activities

- 1 Student visits Distribution Transformer i.e., Pole mount and Plinth mount, note down the ratings of transformer and draw the sketch of the substation mentioning the parts.
- 2 Student should identify voltage ratings of different electrical lines and supports including LA's, Guys etc running near their area and share the information on the same.
- 3 Group discussion
- 4 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	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	
CO1	-	1	3	3	-	-	2	1	2	3	2,3,4,7,8,9,10
CO2	1	3	3	3	-	-	2	1	2	3	1,2,3,4,7,8,9,10
CO3	-	3	3	3	-	-	2	1	2	3	2,3,4,7,8,9,10
CO4	-	3	3	3	-	-	2	1	2	3	2,3,4,7,8,9,10
CO5	-	3	3	3	-	-	2	1	2	3	2,3,4,7,8,9,10
CO6	-	3	3	3	-	-	2	1	2	3	2,3,4,7,8,9,10

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
Assignment	1	5
Seminars	1	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)/ Understanding(U)	2	4	Nil	8 Marks
02	Part-B	Understanding(U)/ Application(A)	2	12	1	12 Marks
Total Marks						20 Marks

MID SEM-I EXAM

S.No	Unit No	R/U	U/A
1	Unit-I	Q1	Q3(a)
2	Unit-II	Q2	Q3(b)
Total Questions		2	2

MID SEM-II EXAM

S.No	Unit No	R/U	U/A
1	Unit-III	Q1	Q3(a)
2	Unit-IV	Q2	Q3(b)
Total Questions		2	2

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)	4	4	Nil	16 Marks
02	Part-B	Understanding(U)/ Application(A)	4	12	2	24 Marks
Total Marks						40 Marks

Unit No	Questions to be set for SEE		
	R/U	U/A	
I	Q1	Q5(a)	
II			
III			
IV			
V	Q2	Q5(b)	Q6(a)
VI	Q3		Q6(b)
	Q4		
Total	4	4	

STATE BOARD OF TECHNICAL EDUCATION & TRAINING , TELANGANA
DIPLOMA IN ELECTRICAL & ELECTRONICS ENGG.
SUB CODE: 18EE-406P
ELECTRICAL ENGG. DRAWING PRACTICE

MID SEM - I EXAM MODEL PAPER

TIME: 1 HOUR

TOTAL MARKS: 20

PART – A

Marks: 2 X 4M = 8

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

1. Draw the following electrical symbols
 - i) Battery
 - ii) Buzzer
 - iii) Capacitor
 - iv) Ammeter
 - v) fuse
2. Draw the cross section of 2 stepped core of one limb of transformer

PART - B

Marks: 1 x 12M = 12

Instructions: (1) Answer the following question.

(2) Each question carries **ten** marks.

3. (a) Draw the following views of a single phase 220/110 V 10 KVA transformer
 - a) Front elevation
 - b) Plan in full section

Core: 1. Cross section of the core = one step core
2. Diameter of the circumcircle = 7.5 cm
3. Distance between core centres = 15 cm
Yoke height = 8 cm
LT winding: 1. Outside diameter of LT coil = 9 cm
2. Inside diameter of LT coil = 8 cm
3. Height of LT winding = 23 cm
4. Number of turns per limb = 50
HT winding: 1. Outside diameter of HT coil = 13.5 cm
2. Inside diameter of LT coil = 11 cm
3. Height of LT winding = 23 cm
4. Number of turns per limb = 100
Total height of the transformer = 40 cm

(OR)

- 3(b) Draw Sectional Plan and Elevation of Rewirable fuse.

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SUB CODE: 18EE-406P
ELECTRICAL ENGG. DRAWING PRACTICE

MID SEM -II EXAM MODEL PAPER

TIME: 1 HOUR

TOTAL MARKS: 20

PART – A

Marks: 2 X 4M= 8

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

1. Draw the cross sectional view of Two core cable.
2. Draw the table to develop winding diagram of a Single phase 4 pole induction motor with 24 slots, single layer full pitched lap winding.

PART - B

Marks: 1 x12M = 12

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

- 3(a) Develop winding diagram for a DC machine with 4 Pole 24 slot simplex Wave progressive winding with table.

OR

- 3(b) Draw the cross sectional view of four-core XLPE insulated armoured cable.

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DIPLOMA IN ELECTRICAL & ELECTRONICS ENGG.
SUB CODE: 18EE-406P
ELECTRICAL ENGG. DRAWING PRACTICE

END SEM EXAM MODEL PAPER

TIME: 2 HRS

TOTAL MARKS: 40

PART – A

Marks: 4 X 4M= 16

- Instructions:** (1) Answer all questions
(2) Each question carries **FIVE** marks.
1. Draw Sectional end view of HRC fuse.
 2. Draw the cross sectional view of 3 core armoured cable
 3. Draw the single line diagram of 33kV / 11kV substation
 4. Draw the free hand sketch of Thyrite type lightning arrester

PART - B

Marks: 2x12M = 24

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

5(a) Draw the elevation of Plinth mounted substation.

OR

5(b) Draw the dimensioned sketch of Plate earthing.

6(a) Draw single line diagram of Grid connected solar PV system.

OR

6(b) Draw the sketch of Minimum oil circuit breaker with neat labeling.

AC Machines Lab

Course Title	: AC Machines Lab Practice	Course Code	: 18EE-407P
Semester	: IV semester	Course Group	: Practical
Teaching Scheme in Periods (L:T:P)	: 15:0:30	Credits	: 1.5
Methodology	: Lecture + Practice	Total Contact Periods	: 45 Periods
CIE (Continuous Internal Evaluation)	: 60 Marks	SEE (Semester End Examination)	: 40 Marks

Pre Requisites

This course requires the knowledge of AC machines Transformers and Alternators.

Course Outcomes

Course Outcome	
CO1	Evaluate the performance of single phase transformer by conducting suitable tests.
CO2	Analyze the load sharing between two Single phase transformers when they are operated in parallel
CO3	Familiarize with Three phase Transformers
CO4	Determine the dielectric strength of transformer oil
CO5	Determine regulation of an Alternator by conducting suitable tests
CO6	Synchronise the given Alternator with Supply Mains

Suggested Learning Outcomes

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

1.0 Evaluate the performance of single phase transformer by conducting suitable tests.

- 1.1 Identify the terminals of a 1-phase transformer.
- 1.2 Conduct turns ratio test on given single phase transformer.
- 1.3 Conduct O.C. and S.C. tests on 1-phase Transformer and from the result
 - a) Draw the equivalent circuit.
 - b) Calculate efficiency at various loads and power factors.
 - c) Find the load at which maximum efficiency occurs.
- 1.4 Obtain efficiency of 1-phase Transformer by conducting load test.
- 1.5 Obtain regulation of 1-phase Transformer by conducting load test.
- 1.6 Obtain the efficiency and regulation of two similar 1-phase transformers by conducting Sumpner's test.

2.0 Analyze the load sharing between two Single phase transformers when they are operated in parallel

- 2.1 Connect two identical 1-ph transformers in parallel and analyze the load sharing.

3.0 Familiarize with Three phase Transformers

- 3.1 Verify the relation between (i) Phase Voltage & Line Voltage (ii) Phase current & Line Current of three phase transformer in Y-Y topology.
- 3.2 Verify the relation between (i) Phase Voltage & Line Voltage (ii) Phase current & Line Current of three phase transformer in Y- Δ topology.
- 3.3 Verify the relation between (i) Phase Voltage & Line Voltage (ii) Phase current & Line Current of three phase transformer in Δ -Y topology.
- 3.4 Verify the relation between (i) Phase Voltage & Line Voltage (ii) Phase current & Line Current of three phase transformer in Δ - Δ topology.

Note: Three single phase transformers may be used instead of a three phase transformer.

4.0 Determine the dielectric strength of transformer oil

- 4.1 Obtain the Dielectric Strength of transformer oil using oil testing kit.

5.0 Determine regulation of an Alternator by conducting suitable tests

- 5.1 Obtain voltage regulation by conducting (direct) load test on Alternator.
- 5.2 Obtain the regulation of Alternator by using synchronous impedance method.

6.0 Synchronise the given Alternator with Supply Mains

- 6.1 Synchronise the given Alternator with supply mains by using bright lamp method

Recommended Books

1. B.L. Theraja-Electrical Technology - Vol -II S.Chand& Co.
2. M.G Say -AC machines
3. P.S. Bhimbra -Electrical machines - Khanna Publishers
4. A.E. Fitzgerald, C. Kingsley and S. Umans Electrical machinery-McGraw Hill
5. MV Deshpande-Electric machines - Wheeler publishing.
6. BR Gupta and VandanaSinghal - Fundamentals of Electric machines

Suggested E-Learning references

1. <http://electrical4u.com/>
2. www.nptel.ac.in
3. <https://www.siemens.com/content/dam/internet/siemens-com/global/products-services>

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	-	3	3	3	2	-	2	3	-	3	2,3,4,5,7,8,10
CO2	-	3	3	3	2	-	2	3	-	3	2,3,4,5,7,8,10
CO3	-	3	3	3	2	-	2	3	-	3	2,3,4,5,7,8,10
CO4	-	3	3	3	2	-	2	3	-	3	2,3,4,5,7,8,10
CO5	-	3	3	3	2	-	2	3	-	3	2,3,4,5,7,8,10
CO6	-	3	3	3	2	-	2	3	-	3	2,3,4,5,7,8,10

**STATE BOARD OF TECHNICAL EDUCATION & TRAINING , TELANGANA
DIPLOMA IN ELECTRICAL & ELECTRONICS ENGG.
MID SEM - I**

Corse Code: 18EE-407P

Duration: 1 hours

Course Name: AC Machines Lab

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 terminals on 1-phase transformer and determine the turn ratio on transformer
 1. Conduct O.C. and S.C. tests on 1-phase Transformer and from the result
 - a) Draw the equivalent circuit.
 - b) Calculate efficiency at various loads and power factors.
 - c) Find the load at which maximum efficiency occurs.
- 2.** Obtain efficiency of 1-phase Transformer by conducting load test.
- 3.** Obtain regulation of 1-phase Transformer by conducting load test.
- 4.** Obtain the efficiency and regulation of two similar 1-phase transformers by conducting Sumpner's test.
- 5.** Connect two identical 1-ph transformers in parallel and analyze the load sharing.

**STATE BOARD OF TECHNICAL EDUCATION & TRAINING , TELANGANA
DIPLOMA IN ELECTRICAL & ELECTRONICS ENGG.
MID SEM - II**

Corse Code: 18EE-407P

Duration: 1 hours

Course Name: AC Machines Lab

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 relation between (i) Phase Voltage & Line Voltage (ii) Phase current & Line Current of three phase transformer in Y-Y topology.
2. Verify the relation between (i) Phase Voltage & Line Voltage (ii) Phase current & Line Current of three phase transformer in Y- Δ topology.
3. Verify the relation between (i) Phase Voltage & Line Voltage (ii) Phase current & Line Current of three phase transformer in Δ -Y topology.
4. Verify the relation between (i) Phase Voltage & Line Voltage (ii) Phase current & Line Current of three phase transformer in Δ - Δ topology.
5. Obtain the Dielectric Strength of transformer oil using oil testing kit.

**STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TELANGANA
DIPLOMA IN ELECTRICAL & ELECTRONICS ENGG.
SEMESTER END EXAMINATION**

Corse Code: 18EE-407P

Duration: 2 hours

Course Name: AC Machines Lab

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 terminals on 1-phase transformer and determine the turn ratio on transformer
2. Conduct O.C. and S.C. tests on 1-phase Transformer and from the result
 - a) Draw the equivalent circuit.
 - b) Calculate efficiency at various loads and power factors.
 - c) Find the load at which maximum efficiency occurs.
3. Obtain efficiency of 1-phase Transformer by conducting load test.
4. Obtain regulation of 1-phase Transformer by conducting load test.
5. Obtain the efficiency and regulation of two similar 1-phase transformers by conducting Sumpner's test.
6. Connect two identical 1-ph transformers in parallel and analyze the load sharing.
7. Verify the relation between (i) Phase Voltage & Line Voltage (ii) Phase current & Line Current of three phase transformer in Y-Y topology.
8. Verify the relation between (i) Phase Voltage & Line Voltage (ii) Phase current & Line Current of three phase transformer in Y- Δ topology
9. Verify the relation between (i) Phase Voltage & Line Voltage (ii) Phase current & Line Current of three phase transformer in Δ -Y topology.
10. Verify the relation between (i) Phase Voltage & Line Voltage (ii) Phase current & Line Current of three phase transformer in Δ - Δ topology.
11. Obtain the Dielectric Strength of transformer oil using oil testing kit.
12. Obtain voltage regulation by conducting (direct) load test on Alternator.
13. Obtain the regulation of Alternator by using synchronous impedance method.
14. Synchronise the given Alternator with supply mains by using bright lamp method

ELECTRICAL CAD LAB PRACTICE

Course Title : Electrical CAD Lab Practice	Course Code : 18EE-408P
Semester : IV semester	Course Group : Practical
Teaching Scheme in Periods : 15:0:30 (L:T:P)	Credits : 1.5
Methodology : Lecture + Practice	Total Contact Periods : 45 Periods
CIE : 60 Marks (Continuous Internal Evaluation)	SEE : 40 Marks (Semester End Examination)

Pre Requisites

This course requires the knowledge of basic commands of CAD software, Construction of Electrical machines, Substations and Power System Equipments

Course Outcomes

Course Outcome	
CO1	Draw the symbols of Electrical Sources, Accessories and components
CO2	Draw the wiring layouts
CO3	Draw the views of Electrical machines
CO4	Draw the single line diagram of the Substations
CO5	Draw the HV line supports
CO6	Draw the views of Earthing

Suggested Learning Outcomes

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

1.0 Draw the symbols of Electrical components

- 1.1 Draw standard symbols of electrical components: Constant Resistor and variable Resistor, Constant Inductor and variable inductor, Constant capacitor and variable capacitor, transformer.

- 1.2 Draw standard symbols of electrical Sources: DC Voltage Source, DC current source, Battery, Single phase AC voltage source, three phase AC voltage source, Wall mounted lamp fixture, Ceiling fan.
- 1.3 Draw standard symbols of electrical Accessories: One way Switch and two way Switch, Normally Open & Normally Close Push buttons, Fuse, Circuit breaker, Isolators and Ground.

2.0 Draw the wiring layouts

- 2.1 Draw the wiring layout for a given Single bedroom house.
- 2.2 Draw the Wiring diagram of 3 phase Induction motor with energy meter, 1-phase preventer, Y- Δ starter with control panel/switchboard.
- 2.3 Draw the wiring layout of Pump shed for given dimensions.
- 2.4 Draw the wiring layout of workshop(with 2 or 3 Induction motors)

3.0 Draw the views of Electrical machines

- 3.1 Draw the cross section of single stepped core of one limb of transformer.
- 3.2 Draw the cross section of 2 stepped core of one limb of transformer.
- 3.3 Draw the cross section of 3 stepped core of one limb of transformer.
- 3.4 Draw sectional Plan of a single-phase single stepped core type Transformer from the given data.
- 3.5 Draw sectional plan of a 3 phase three stepped core type transformers from the given data.
- 3.6 Draw Plan & Elevation of a 3 phase transformers with cooling tubes.
- 3.7 Draw Elevation & End view of a 3 Squirrel cage Induction motor.
- 3.8 Draw Elevation & End view of a 3 Slip ring Induction motor.

4.0 Draw the single line diagram of the Substations

- 4.1 Draw the single line diagram of 33kV / 11kV substation.
- 4.2 Draw single line diagram of Grid connected solar PV system.

5.0 Draw the HV line supports

- 5.1 Draw the sketch of 132 KV steel tower of single circuit.
- 5.2 Draw the sketch of 132 KV steel tower of double circuit.
- 5.3 Draw the sketch of 220 KV steel towers of single circuit.
- 5.4 Draw the sketch of 220 KV steel towers of double circuit.

6.0 Draw the views of Earthing

- 6.1 Draw the dimensioned sketch of Plate earthing.
- 6.2 Draw the dimensioned sketch of Pipe earthing

Recommended Books

1. Computer Aided Electrical Drawing
- YOGESH, NAGARAJA, NANDAN PHI Publication
2. Electrical Drafting - S.F. DEVALAPUR EEPB
3. Electrical Drawing - K.L. NARANG
4. Electrical Engineering Drawing – S. K. BHATTACHARYA
5. QCAD - An Introduction to Computer-Aided Design - By Andrew Mustun

Suggested E-Learning references

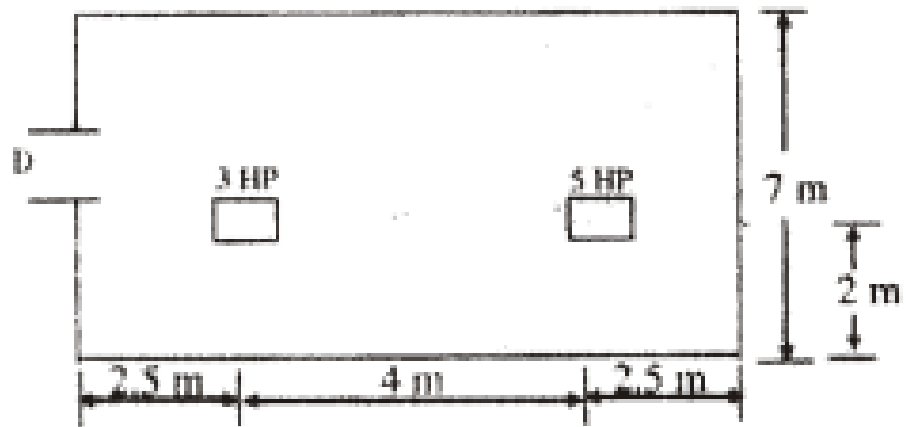
1. http://www.faveodesign.co.uk/CAD_Drawings.html
2. http://cad.about.com/od/Learn_CAD/a/The-Fundamentals-Of-Drafting.htm
3. <http://transport.itu.edu.tr/PDF/iml332e/Fundamentals%20of%20CAD>.

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	-	1	3	3	1	-	2	1	-	3	2,3,4,5,7,8,10
CO2	1	3	3	3	1	-	2	1	-	3	1,2,3,4,5,7,8,10
CO3	-	3	3	3	1	-	2	1	-	3	2,3,4,5,7,8,10
CO4	-	3	3	3	1	-	2	1	-	3	2,3,4,5,7,8,10
CO5	-	3	3	3	1	-	2	1	-	3	2,3,4,5,7,8,10
CO6	-	3	3	3	1	-	2	1	-	3	2,3,4,5,7,8,10

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

7 Draw the wiring layout of given workshop.



STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TELANGANA
DIPLOMA IN ELECTRICAL & ELECTRONICS ENGG.
MID SEM - II

Corse Code: 18EE-408P

Duration: 1 hours

Course Name: Electrical CAD 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 cross section of single stepped core of one limb of transformer.
- 2 Draw the cross section of 2 stepped core of one limb of transformer.
- 3 Draw the cross section of 3 stepped core of one limb of transformer.
4. Draw sectional Plan of a 1-phase, 220/660 V, 2 kVA core-type transformer with the following data : Cross-section of the core is One step, Diameter of the circle 6 cm, Distance between core centres 13cm.
LT Winding: Outer diameter of 1st layer 9cm Inner diameter of 1st layer 6.5 cm
HT Winding: Outer diameter of HT winding 11 cm Inner diameter of HT winding 9.5 cm.
5. Draw sectional plan of a 3-phase, 220/660 V, 10 kVA core-type transformer with the following data: Cross-section of the core is 3 stepped Diameter of the circle 6.5 cm Distance between core centres 18.5 cm.
LT Winding: Outer diameter of 1st layer 9.25 cm Inner diameter of 1st layer 7.0 cm Outer diameter of 2nd layer 12.1 cm Thickness of each layer 1.2 cm
HT Winding: Outer diameter of HT winding 17.0 cm Inner diameter of HT winding 12.5 cm
- 6 Draw Plan & Elevation of a 3 phase transformers with cooling tubes.
- 7 Draw Elevation & End view of a 3 Squirrel cage Induction motor.
- 8 Draw Elevation & End view of a 3 Slip ring Induction motor.
- 9 Draw the single line diagram of 33kV / 11kV substation.
- 10 Draw single line diagram of Grid connected solar PV system.

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

Corse Code: 18EE-408P

Duration: 2 hours

Course Name: Electrical CAD Lab Practice

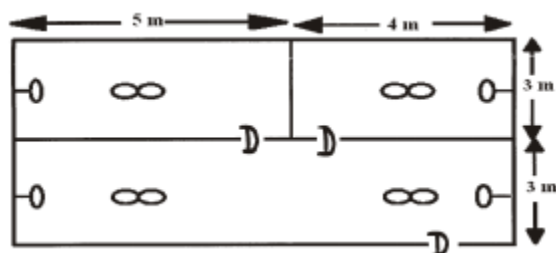
Max.Marks: 40

Note: Answer allotted Question.

Instructions to the Candidate:

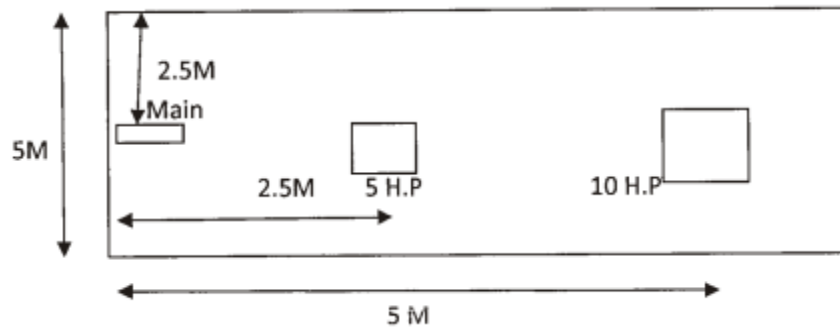
(i) Choose appropriate values when not mentioned in the question

1. Draw standard symbols of electrical components: Constant Resistor and variable Resistor, Constant Inductor and variable inductor, Constant capacitor and variable capacitor, transformer.
2. Draw standard symbols of electrical components: DC Voltage Source, DC current source, Battery, Single phase AC voltage source, three phase AC voltage source, Wall mounted lamp fixture, Ceiling fan.
3. Draw standard symbols of electrical fixtures: On way Switch and two way Switch, Normally Open & Normally Close Push buttons, Fuse, Circuit breaker, Isolators and Ground.
4. Draw the wiring layout for a given Single bedroom house.



5. Draw the Wiring diagram of 3 phase Induction motor with energy meter, 1-phase preventer, Y- Δ starter with control panel/switchboard.
6. Draw the wiring layout of an irrigation pump set of 7.5 kW is to be installed at a distance of 15 m from a 3-phase, 415 V, distribution line. The pump room dimensions are 3 m $\times$ 5 m, -3.5 m height. Efficiency and power factors are 85% and 0.9 respectively. Assume any missing data.

7. Draw the wiring layout of workshop



8. Draw the cross section of single stepped core of one limb of transformer with diameter of circle as 6 cm.
9. Draw the cross section of 2 stepped core of one limb of transformer with diameter of circle as 8 cm.
10. Draw the cross section of 3 stepped core of one limb of transformer with diameter of circle as 7.5 cm.
11. Draw sectional Plan of a 1-phase, 220/660 V, 2 kVA core-type transformer with the following data : Cross-section of the core is One step, Diameter of the circle 6 cm, Distance between core centres 13cm.
 LT Winding: Outer diameter of 1st layer 9cm Inner diameter of 1st layer 6.5 cm
 HT Winding: Outer diameter of HT winding 11 cm Inner diameter of HT winding 9.5 cm.
12. Draw the sectional plan of a 3-phase, 220/660 V, 10 kVA core-type transformer with the following data: Cross-section of the core is 3 stepped Diameter of the circle 6.5 cm Distance between core centres 18.5 cm.
 LT Winding: Outer diameter of 1st layer 9.25 cm Inner diameter of 1st layer 7.0 cm Outer diameter of 2nd layer 12.1 cm Thickness of each layer 1.2 cm
 HT Winding: Outer diameter of HT winding 17.0 cm Inner diameter of HT winding 12.5 cm
13. Draw Plan & Elevation of a 3 phase transformers with cooling tubes.
14. Draw Elevation & End view of a 3 Squirrel cage Induction motor.
15. Draw Elevation & End view of a 3 Slip ring Induction motor.
16. Draw the single line diagram of 33kV / 11kV substation.
17. Draw single line diagram of Grid connected solar PV system.
18. Draw the sketch of 132 KV steel tower of single circuit.
19. Draw the sketch of 132 KV steel tower of double circuit.
20. Draw the sketch of 220 KV steel towers of single circuit.
21. Draw the sketch of 220 KV steel towers of double circuit.
22. Draw the dimensioned sketch of Plate earthing.
23. Draw the dimensioned sketch of Pipe earthing

Digital Electronics Lab Practice

Course Title	:Digital Electronics Lab Practice	Course Code	:18EE-409P
Semester	:IV	Course Group	:Core
Teaching Scheme in Periods(L:T:P)	:15:0:30	Credits	:1.5
Methodology	:Lecture + Practical	Total Contact Periods	:45 pds
CIE	:60 marks	:SEE	:40 Marks

Pre requisites

This course requires basic understanding of Boolean Algebra and Logic Gates.

Course Outcomes

Course Outcome	
CO1	Verify the truth tables of Logic gates
CO2	Minimize the given Boolean expression using Boolean theorems and K-Maps
CO3	Verify simple combinational circuits.
CO4	Analyse the operation of Flip-Flops.
CO5	Apply the knowledge of Flip-Flops to design counters.

Suggested Learning Outcomes

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

- 1.1 Identify the different parts of the digital trainer kit and precautions to be followed in handling ICs.
- 1.2 Identify Digital ICs, noting down pin details from data sheet and pins of ICs.
- 1.3 Verify the Truth Table of Basic logic gates AND, OR and NOT.
- 1.4 Verify the truth table of universal gates NAND and NOR gates.
- 1.5 Verify the truth table of XOR and XNOR gates.

- 1.6 Implement Basic Gates using NAND and NOR Gates and validate their operation.
- 1.7 Implement XOR and XNOR gates using NAND and NOR Gates and Validate their operation.

1.0 Minimize the given Boolean expression using Boolean theorems and K-Maps

- 2.1 Verify De Morgan's theorems.
- 2.2 Verify commutative, associative and distributive Boolean laws using suitable logic gates.
- 2.3 Verify the reduced expression of the given Boolean expression using Boolean theorems and K-Maps.

3.0 Verify simple combinational circuits.

- 3.1 Verify the truth table of Half-adder circuit.
- 3.2 Verify the truth table of Full-adder circuit.
- 3.3 Verify the operation of 4:1 Multiplexer.
- 3.4 Verify the operation of 1:4 De-Multiplexer
- 3.5 Verify operation of 3 to 8 line Decoder.

4.0 Analyse the operation of Flip-Flops.

- 4.1. Verify the truth table of RS Flip flop.
- 4.2. Verify the truth table of clocked J-K Flip-Flop
- 4.3. Verify the truth table of clocked D - Flip-Flop.
- 4.4. Verify the truth table of clocked T- Flip-Flop.
- 4.5. To realize D - Flip-Flop using J-K Flip-Flop and validate their operation.
- 4.6. To realize T - Flip-Flop using J-K Flip-Flop and validate their operation.

5.0 Apply the knowledge of Flip-Flops to design counters.

- 5.1 Verify the operation of a 3-bit or 4-bit ring counter using suitable flip-flop IC.
- 5.2 Verify the operation of a 3-bit or 4-bit Asynchronous UP counter using suitable flip-flop IC.
- 5.3 Verify the operation of a 3-bit or 4-bit Asynchronous DOWN counter using suitable flip-flop IC.
- 5.4 Verify the operation of a 3-bit or 4-bit Synchronous UP counter using suitable flip-flop IC.

Recommended Books

- 1 Digital Systems-principles and applications. Ronald J. Tocci, Neal S.Widmer, GregoryL.Moss, 10th edition
- 2 Digital Fundamentals by T. L. Floyd, Pearson International Publications, Ninth Edition, 2000.
- 3 Digital Computer Electronics by Malvino and leach. 3rd edition Tata McGraw-Hill Education
- 4 Modern Digital Electronics by R P Jain, Tata McGraw-Hill Education, 2003.

Suggested E-Learning references

1. www.nptel.ac.in
2. <http://freevideolectures.com/Course/3164/Digital-Electronics>
3. <http://www.freebyte.com/electronics/>
4. <https://www.circuitlogix.com>
5. <http://www.vlab.co.in>
6. www.electronics-tutorials.ws
7. <http://www.allaboutcircuits.com>
8. <http://ocw.mit.edu/>

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	-	3	3	2	2	-	2	3	-	3	2,3,4,5,7,8,10
CO2	-	3	3	-	2	-	2	3	-	3	2,3,5,7,8,10
CO3	-	3	3	-	2	-	2	3	-	3	2,3,5,7,8,10
CO4	-	3	3	-	2	-	2	3	-	3	2,3,5,7,8,10
CO5	-	3	3	-	2	-	2	3	-	3	2,3,5,7,8,10

State Board of Technical Education and Training, Telangana

Semester End Examination Model Question paper

DEEE IV MID SEM I

Course Code: 18EE-409P

Duration:1 hours

Course Name: Digital electronics Lab Practice

Max.Marks:20

Instructions to the Candidate:

(i) Answer any One of the following Questions.

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

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

- 1 Identify the different parts of the digital trainer kit and precautions to be followed in handling ICs.
- 2 Identify Digital ICs, noting down pin details from data sheet and pins of ICs.
- 3 Verify the Truth Table of Basic logic gates AND, OR and NOT.
- 4 Verify the truth table of universal gates NAND and NOR gates.
- 5 Verify the truth table of XOR and XNOR gates.
- 6 Implement Basic Gates using NAND and NOR Gates and validate their operation.
- 7 Implement XOR and XNOR gates using NAND and NOR Gates and Validate their operation.
- 8 Verify De Morgan's theorems.
- 9 Verify commutative, associative and distributive Boolean laws using suitable logic gates.

State Board of Technical Education and Training, Telangana

Semester End Examination Model Question paper

DEEE IV MID SEM II

Corse Code: 18EE-409P

Duration:1 hours

Course Name: Digital electronics Lab Practice

Max.Marks:20

Instructions to the Candidate:

(i) Answer any One of the following Questions.

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

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

- 1 Verify the reduced expression of the below Boolean expression using Boolean theorems and K-Maps.
$$X = \bar{A}.\bar{B}.\bar{C} + A.\bar{B}.\bar{C} + \bar{A}.B.\bar{C} + A.B.\bar{C}$$
- 2 Verify the truth table of Half-adder circuit.
- 3 Verify the truth table of Full-adder circuit.
- 4 Verify the operation of 4:1 Multiplexer.
- 5 Verify the operation of 1:4 De-Multiplexer
- 6 Verify operation of 3 to 8 line Decoder.
- 7 Verify the truth table of RS Flip flop.
- 8 Verify the truth table of clocked J-K Flip-Flop
- 9 Verify the truth table of clocked D - Flip-Flop.
- 10 Verify the truth table of clocked T- Flip-Flop.

State Board of Technical Education and Training, Telangana

Semester End Examination Model Question paper

DEEE IV semester practical Examination

Corse Code: 18EE-409P

Duration:2 hours

Course Name: Digital electronics Lab Practice

Max.Marks:40

Instructions to the Candidate:

(i)Answer any One of the following Questions.

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

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

- 1 Identify the different parts of the digital trainer kit and precautions to be followed in handling ICs.
- 2 Identify Digital ICs, noting down pin details from data sheet and pins of ICs.
- 3 Verify the Truth Table of Basic logic gates AND, OR and NOT.
- 4 Verify the truth table of universal gates NAND and NOR gates.
- 5 Verify the truth table of XOR and XNOR gates.
- 6 Implement Basic Gates using NAND and NOR Gates and validate their operation.
- 7 Implement XOR and XNOR gates using NAND and NOR Gates and Validate their operation.
- 8 Verify De Morgan's theorems.
- 9 Verify commutative, associative and distributive Boolean laws using suitable logic gates.
- 10 Verify the reduced expression of the below Boolean expression using Boolean theorems and K-Maps.

$$\bar{A}.B.\bar{C} + A.\bar{B}.\bar{C} + A.B.\bar{C}$$

- 11 Verify the truth table of Half-adder circuit.
- 12 Verify the truth table of Full-adder circuit.
- 13 Verify the operation of 4:1 Multiplexer.
- 14 Verify the operation of 1:4 De-Multiplexer
- 15 Verify operation of 3 to 8 line Decoder.
- 16 Verify the truth table of RS Flip flop.
- 17 Verify the truth table of clocked J-K Flip-Flop
- 18 Verify the truth table of clocked D - Flip-Flop.
- 19 Verify the truth table of clocked T- Flip-Flop.
- 20 To realize D - Flip-Flop using J-K Flip-Flop and validate their operation.
- 21 To realize T - Flip-Flop using J-K Flip-Flop and validate their operation

- 22 Verify the operation of a 3-bit or 4-bit ring counter using suitable flip-flop IC.
- 23 Verify the operation of a 3-bit or 4-bit Asynchronous UP counter using suitable flip-flop IC.
- 24 Verify the operation of a 3-bit or 4-bit Asynchronous DOWN counter using suitable flip-flop IC.
- 25 Verify the operation of a 3-bit or 4-bit Synchronous UP counter using suitable flip-flop IC.

Advanced Communication Skills and Life Skills

Course Title	Advanced Communication Skills and Life Skills	Course Code	18EE- 410 P
Semester	IV	Course Group	Foundation
Teaching Scheme in Periods- L:T:P	15:0:30	Credits	1.5
Methodology	Lecture + Practical	Total Contact Periods	45 Periods
CIE	60 Marks	SEE	40 Marks

Rationale:

This course is designed to impart writing skills and employability skills to the students of diploma which will help them in obtaining and maintaining the employment.

Prerequisites:

This course requires the basic knowledge of vocabulary, grammar and four language learning skills, viz. Listening, Speaking, Reading and Writing.

Course Outcomes:

Modules	At the end of the course the students will have the ability to:
Presentation Skills	Prepare a presentation. Use presentation aids effectively. Develop public speaking skills. Learn to make PowerPoint Presentations effectively. Present a Paper using appropriate body language.
Writing Reports	Learn kinds of reports. Learn the format of a report. Organise ideas. Develop essential vocabulary useful to write scientific and technical reports.

Interview Skills	Learn the techniques to face an interview. Learn the etiquette to communicate with employers. Learn the dos and don'ts of an interview. Learn the frequently asked questions in interviews. Use appropriate body language. Learn to face interviews telephonically. Gain the confidence to face an interview by attending mock interview.
Group Discussion	Learn the dos and don'ts of a Group Discussion. Participate in a Group Discussion in a healthy manner. Use effective non-verbal communication. Use appropriate phrases and expressions useful in a group discussion.
Workplace Awareness	Learn workplace etiquette. Identify the knowledge, skills and attributes useful at workplace. Build strong workplace relationships. Learn professional ethics. Understand gender equality at the workplace Develop a sense of responsibility towards the society.
Writing Skills Useful at Workplace	Learn various writing formats useful at workplace. Develop an ability to apply technical information in documentation. Revise and edit written documents effectively. Develop corresponding skills - learn the kinds of business letters - the format of a business letter.

	Learn effective e-mail writing skills. Learn Business Memos. Learn Notes and Narratives. Learn Forms and Applications. Prepare templates for different purposes. Prepare an agenda of a meeting. Prepare the minutes of a meeting. Prepare Notices / Circulars for various purposes. Prepare Press release.
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CO-PO Matrix

	Course Outcome		Linked PO
CO 1	Making effective presentations	R/U/A	1, 2, 3,4, 5,6,7,8,9,10
CO 2	Writing scientific and technical reports	R/U/A	1,2,3,4, 5,6,7,8,9,10
CO 3	Learn to face oral and telephonic interviews	R/U/A	1,2,3,4, 7,9,
CO 4	Learn to face group discussion	R/U/A	1,2,3,7,8,9
CO 5	Learn to write various formats useful at workplace	R/U/A	1,2,3,5,7,8,9,10
CO6	Learn workplace etiquette and ethics	R/U/A	1,2,3,7,8,9,10

Course Contents:

I. Presentation Skills	Duration: 6
periods	
II. Writing Reports	Duration: 9
periods	
III. Interview Skills	Duration: 9
periods	
IV. Group Discussion	Duration: 6
periods	

V. Workplace Awareness Duration: 6
periods

VI. Writing Skills Useful at Workplace Duration: 9
periods

Suggested Student Activities:

- Paper Presentations
- Seminars
- Mock Interviews
- Telephonic Interviews
- Group Discussions
- Role Plays
- Creating advertisements
- Five-minute activities
- Creating a model of workplace

Evaluation Pattern:

I. Continuous Internal Examination: 60
Marks

a. **Mid Sem - I** 20 marks

Syllabus:

- i. Presentation Skills
- ii. Writing Reports

b. **Mid – II:** 20 Marks

Syllabus:

- i. Interview Skills
- ii. Group Discussion

c. **Internal assessment:** 20 marks

- i. Seminars: 10 marks
- ii. Assignments: 5 marks

iii. Lab record submission:

5 marks

**II. Semester End Examination :
Marks**

40

- | | |
|---|----------|
| a. Write an essay on a given topic or participate in an activity: | 15 Marks |
| b. Interview or Group Discussion: | 15 Marks |
| c. Viva Voce | 10 marks |

References:

Adair, John. *Effective Communication*. London: Pan Macmillan Ltd., 2003.

Ajmani, J. C. *Good English: Getting it Right*. New Delhi: Rupa Publications, 2012.

Amos, Julie-Ann. *Handling Tough Job Interviews*. Mumbai: Jaico Publishing, 2004.

Collins, Patrick. *Speak with Power and Confidence*. New York: Sterling, 2009.

Fensterheim, Herbert and Jean Baer. *Don't Say Yes When You Want To Say No*. New York: D

Raman, Meenakshi & Sangeeta Sharma. *Technical Communication: Principles and Practice*. Second Edition. New Delhi: Oxford University Press, 2011

E-Learning Resources:

<http://www.dailywritingtips.com/>

<http://www.englishdaily626.com/c-errors.php>

<http://www.owl.net.rice.edu/~cainproj/>

<http://www.thehumorsource.com/>

<http://www.indiabix.com/group-discussion/topics-with-answers/>

<http://networketiquette.net/>

<https://public.wsu.edu/~brians/errors>

<http://www.bbc.co.uk/worldservice/learningenglish/radio/specials/15>

BOARD DIPLOMA EXAMINATION (C-18)
FOURTH SEMESTER 18EE-410P
ADVANCED COMMUNICATION SKILLS AND LIFE SKILLS

MID SEM - I

Time : 1 Hour

Total Marks: 20 Marks

Part – A

10 marks

Instruction: Answer any one of the following questions.

1. Write the guidelines for preparing a PowerPoint presentation.
2. How do you prepare yourself for presenting a technical paper?
3. Mention a few presentation aids and how do you use them effectively?

Part – B

10 marks

Instruction: Answer any one of the following questions.

4. Write the format of a report and describe it.
5. Write a report on the accident you have seen recently.
6. Give the outline of a project report and describe it.

BOARD DIPLOMA EXAMINATION (C-18)
FOURTH SEMESTER , 18EE-410P
ADVANCED COMMUNICATION SKILLS AND LIFE SKILLS
MID SEM - II

Time : 1 Hour

Total Marks: 20 Marks

Part – A

10 marks

Instruction: Answer any one of the following questions.

1. What are the dos and don'ts for a formal interview?
2. What at least ten frequently asked questions in a formal interview?
3. How do you prepare for a telephonic interview?

Part – B

10 marks

Instruction: Answer any one of the following questions.

4. What are the dos and don'ts of a group discussion?
5. Mention some phrases and expressions commonly used in a group discussion.
6. Write a short paragraph on the steps you take while participating in a group discussion.

BOARD DIPLOMA EXAMINATION (C-18)
FOURTH SEMESTER 18EE-410P
ADVANCED COMMUNICATION SKILLS AND LIFE SKILLS
SEMESTER END EXAM

Time : 3 Hours

Total Marks: 40 Marks

Part – A

10 marks

Instruction: Pick any one question from the given lot.

1. Prepare the outline of a project report and describe it.
2. Write the guidelines for preparing the slides of a PowerPoint presentation.
3. Write the minutes of the meeting conducted at the Principal's chamber to conduct the annual day celebrations. Prepare the agenda of the annual day celebrations.
4. Describe the workplace etiquette.
5. Prepare a press note for the '*Job Mela*' which is going to be conducted at your institute.

Part – B

15 marks

6. Interview / Group Discussion

Part – C

15 marks

7. *Viva Voce*