AR20

CODE: 20BST204 **SET-2**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

II B.Tech.II Semester Regular/Supplementary Examinations, May, 2023

Probability & Statistics with R

(COMMON TO CSE, CSM & IT)

Time: 3 Hours **Max Marks: 60**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the Question must be answered at one place

			Marks	CO	Blooms Level
		UNIT-I			
1.		A player tosses 3 fair coins. He wins Rs. 500 if 3 heads appear, Rs. 300 if 2 heads appear, Rs. 100 if 1 head occurs. On the other hand, he loses Rs. 1500 if 3 tails occur. Find the expected gain of the player.	10	CO1	K1
		(OR)			
2.	a.	The incidence of an occupational disease in an industry is such that the workers have a 20% chance of suffering from it. What is the probability that out of 6 workers chosen at random, four or more will suffer from the disease?	5	CO1	K1
	b.	A car-hire firm has two cars which it hires out day by day. The number of demands for a car on each day is distributed as a Poison distribution with mean 1.5. Determine the proportion of days (i) on which there is no demand (ii) on which demand is refused.	5	CO1	K1
		UNIT-II			
3.	a.	A continuous random variable has the probability density function $f(x) = \begin{cases} k\ x\ e^{-\lambda x}, for\ x \geq 0, \lambda > 0 \\ 0, \quad \text{otherwise} \end{cases}$ .Obtain (i) k (ii) mean (iii) Variance.	5	CO2	K3
	b.	If X is a continuous random variable and $Y=aX+b$, prove that $E(Y) = aE(X) + b$ and $V(Y) = a^2V(X)$, where V stands for variance and *a, b* are constants.	5	CO2	K5
		(OR)			
4.	a.	If X is a normal variate with mean 30 and standard deviation 5. Estimate (i) $P(26 \leq X \leq 40)$ (ii)$P(X \geq 45)$.	4	CO2	K5
	b.	Suppose the weights of 800 male students are normally distributed with mean $\mu = 140\ pounds$ and standard deviation 10 pounds. Calculate the number of students whose weights are (i) between 138 and 148 pounds (ii) more than 152 pounds.	6	CO2	K3
		UNIT-III			
5.		A population consists of four numbers2, 3, 4, 5. Consider all possible distinct samplesof size two without replacement. Determine(i) the populationmean (ii) the population standard deviation (s.d.)(iii) the sampling distribution of means (iv) the meanof the S.D. of means (v) s.d. of S.D. of means. Verify(iii) and (v) directly from (i) and (ii) by use of suitableformulae.	10	CO3	K5
		(OR)			

6. a. A random sample of size 81 was taken whose variance is 20.25 and mean is 32, construct 98% confidence interval. 5 CO3 K5

b. In a study of an automobile insurance a random sample of 80 body repair costs had a mean of Rs. 472.36 and a standard deviation of Rs. 62.35. if x is used as point estimate to the true average repair costs, with what confidence we can assert that maximum error does not exceed Rs. 10? 5 CO3 K5

UNIT-IV

7. a. Explain about null hypothesis and testing of null hypothesis. 4 CO4 K2

b. In a sample of 1000 people in Karnataka 540 are rice eaters and the rest are wheat eaters. Can we assume that both rice and wheat are equally popular in this state at 1% level of significance? 6 CO4 K4

(OR)

8. a. Explain short notes on type I and type II errors. 4 CO4 K2

b. A company claims that the mean thermal efficiencyof diesel engines produced by themis 32.3%. To test this claim, a random sampleof 40 engines were examined which showedthe mean thermal efficiency of 31.4% and s.dof 1.6%. Can the claim be accepted or not, at0.01 L.O.S.? 6 CO4 K4

UNIT-V

9. a. An auditor claims that he takes on an average10.5 days to file income tax returns (I.T. returns).Can this claim be accepted if a randomsample shows that he took 13, 19, 15, 10, 12,11, 14, 18 days to file I.T. returns? Use 0.01L.O.S. 5 CO5 K3

b. Can we conclude that the two population variancesare equal for the following data ofpost graduates passed out from a 'state' and'private' university. 5 CO5 K4

State:	8350	8260	8130	8340	8070	
Private:	7890	8140	7900	7950	7840	7920

(OR)

10. Test for goodness of fit of a binomial distributionto the data given below: 10 CO5 K4

X_i	0	1	2	3	4	5	6
O_i	5	18	28	12	7	6	4

UNIT-VI

11. For the following data determine 10 CO6 K5

(i) least squares regression line of y on x
(ii) $y(3)$
(iii) least squares regression line of x on y
(iv) $x(4)$

x	6	5	8	8	7	6	10	4	9	7
y	8	7	7	10	5	8	10	6	8	6

(OR)

12. Evaluate Karl Pearson's correlation coefficient for the following paired data. 10 CO6 K5

X	38	45	46	38	35	38	46	32	36	38
Y	28	34	38	34	36	26	28	29	25	36

What inference would you draw from estimate?

AR20

CODE: 20EST203 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

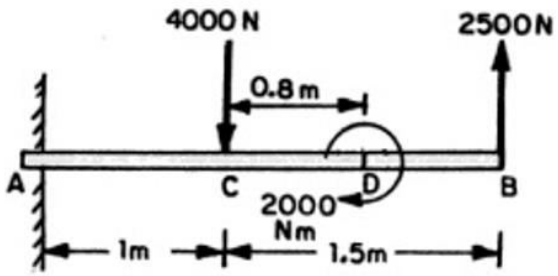
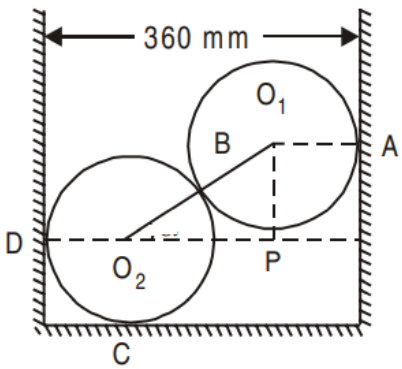
II B.Tech. II Semester Regular/Supplementary Examinations, May, 2023

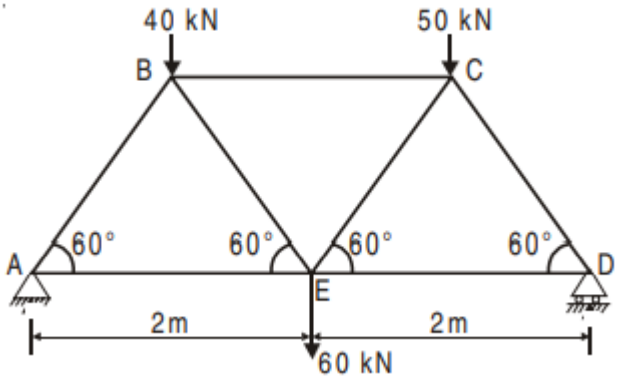
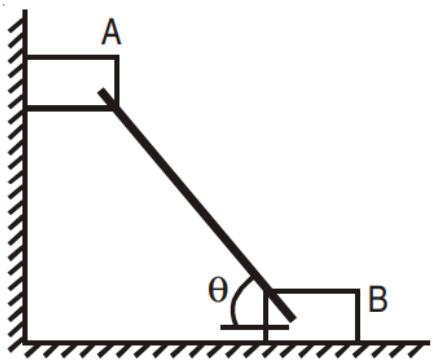
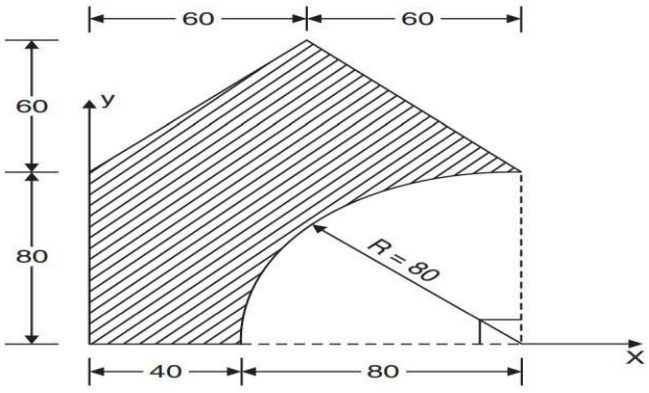
ENGINEERING MECHANICS

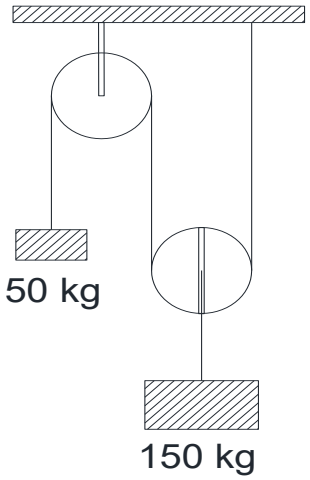
(ELECTRICAL AND ELECTRONICS ENGINEERING)

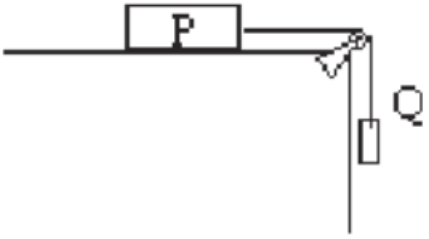
Time: 3 Hours **Max Marks: 60**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the Question must be answered at one place

		UNIT-I	Marks	CO	Blooms Level
1.	(a)	The resultant of the two forces when they act at an angle of 65^0 is 20 N. If the same forces are acting at right angles their resultant is 16.5 N. Determine the magnitude of the two forces.	7	1	3
	(b)	A force of 100N makes angles of 30^0, 60^0 and 100^0 with x,y, z axes respectively. Find the components of the force along the x,y and z axes.	3	1	3
		(OR)			
2.		Five strings are tied at a point and are pulled in all directions, equally spaced (each 72^0) from one another. If the magnitude of the pulls on three consecutive strings is 70 N, 40 N and 55 N respectively, find the magnitude of the pulls on two other strings, if the system is in equilibrium.	10	1	3
		UNIT-II			
3.		Fig.1. shows two vertical forces and a couple acting on a horizontal rod which is fixed at end A. (i). Determine the resultant of the system, (ii). Determine an equivalent system through A.  Fig.1.	10	2	3
		(OR)			
4.		Two smooth spheres each of radius 100 mm and weight 100 N, rest in a horizontal channel having vertical walls, the distance between which is 360 mm. Find the reactions at the points of contacts A, B, C and D shown in Fig.2.  Fig.2.	10	2	3

	UNIT-III			
5.	Determine the forces in all the members of the truss shown in Fig. 3. and indicate the magnitude and nature of forces on the diagram of the truss. All inclined members are at 60° to horizontal and length of each member is 2 m.  Fig. 3.	10	3	3
	(OR)			
6.	Two identical blocks A and B are weighing 30N each and connected by a rod and they rest against vertical and horizontal planes respectively as shown in Fig.4. If sliding impends when θ = 45°, determine the coefficient of friction, assuming it to be same for both floor and wall.  Fig.4.	10	3	3
	UNIT-IV			
7.	Locate the centroid of the shaded area shown in Fig.5. All dimensions are in mm.  Fig.5.	10	4	3
	(OR)			

8.	(a)	State theorems of Pappus-Guldinus.	3	4	2
	(b)	Define moment of inertia and derive the parallel axis theorem.	7	4	2
		2 of 3			
		UNIT-V			
9.	(a)	A body moves along a straight line and its acceleration 'a' which varies with time 't' is given by a =2-3t. Five seconds after the start of observation, the velocity is 20 m/s. The distance moved by the body 10sec after the start of observation of motion from origin is 85 m. Determine the following: i). The acceleration, velocity and distance from the origin at the start of observation. ii). The time after the start of observation at which the velocity becomes zero and the distance travelled from the origin.	5	5	3
	(b)	A car is uniformly accelerated and passes successive kilometre-stones with velocities of 20km/hr and 30km/hr respectively. Calculate its velocity when it passes the next kilometre stone and the time taken for each of these two intervals of one km.	5	5	3
		(OR)			
10.	(a)	Two masses m_1 and m_2 are connected by a light inextensible string which passes over a smooth massless pulley. Find the acceleration of the centre of mass of the system.	5	5	3
	(b)	A solid cylinder rolls down an inclined plane from rest and undergoes slipping. It has mass m and radius r. i) What is its linear acceleration? ii) What is its angular acceleration about an axis through the center of mass?	5	5	3
		UNIT-VI			
11.		Determine the tension in the strings and acceleration of two blocks of mass 150 kg and 50 kg connected by a string and a frictionless and weightless pulley as shown in Fig.6.  Fig.6.	10	6	3
		(OR)			

12.	Find the acceleration of the moving loads as shown in Fig.6. Take mass of P=120 kg and that of Q=80 Kg and coefficient of friction between surfaces of contact is 0.3. Also find the tension in the connecting string. 	10	6	3

AR20

CODE: 20EST206 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

II B. Tech. II Semester Regular/Supplementary Examinations, May, 2023

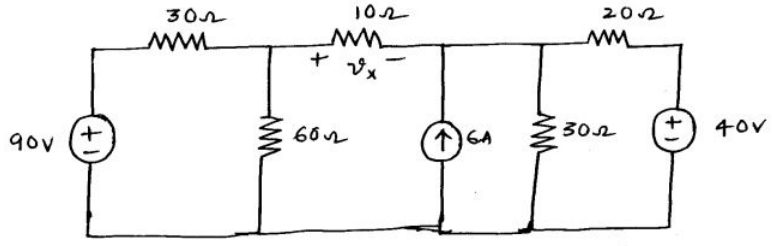
NETWORK ANALYSIS

(ELECTRONICS AND COMMUNIATION ENGINEERING)

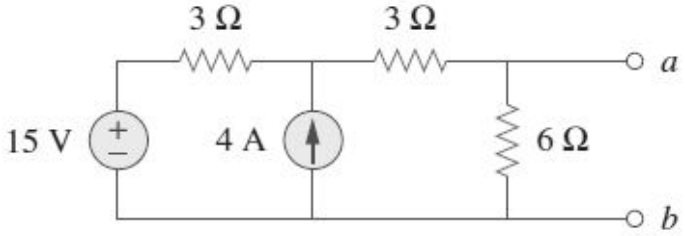
Time: 3 Hours **Max Marks: 60**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the Question must be answered at one place

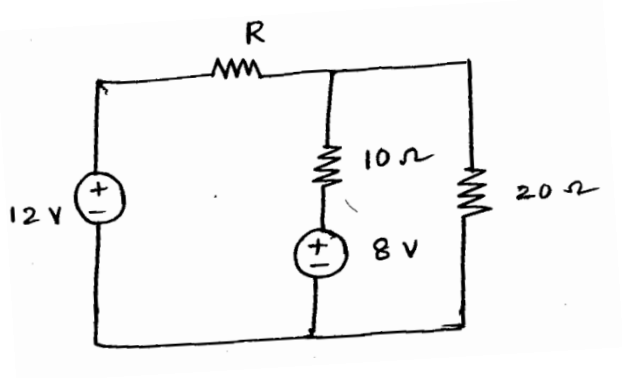
			Marks	CO	Blooms Level
		UNIT-I			
1.	a.	Use Superposition theorem to obtain v_x in the circuit shown below.	5	1	3



	b.	State and Explain Thevenin's Theorem	5	1	1
		(OR)			
2.	a	Find the Norton equivalent circuit for the circuit shown in the figure at terminals *a-b*.	5	1	3



	b	State and explain Superposition Theorem	5	1	
		UNIT-II	Marks	CO	Blooms Level
3.	a	State and explain Millman's Theorem.	5	2	1
	b	Compute the value of *R* that results in maximum power transfer to the 10 Ω resistor for the circuit shown below. Find also the maximum power.	5	2	3

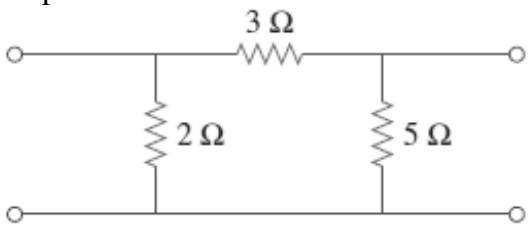


(OR)

4.	a	State and explain Compensation Theorem.	5	2	1
	b	State Tellegan's and Substitution theorem with examples.	5	2	2

UNIT-III

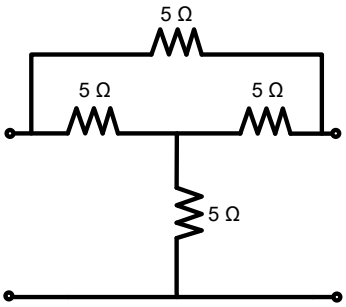
			Marks	CO	Blooms Level
5.	a.	Determine the *h* parameters for the circuit shown below	5	3	3



	b	Derive the relationship between Z and Y Parameters	5	3	2

(OR)

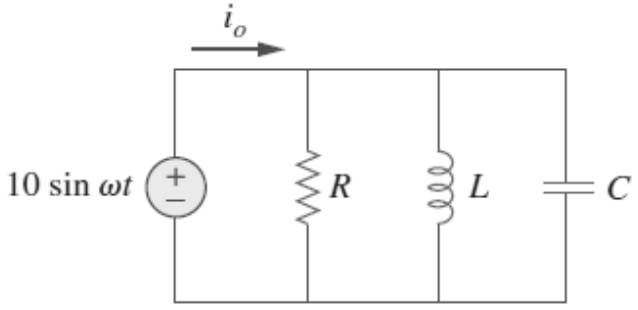
6.	a	Obtain the Y-parameter of the network shown in the figure.	5	3	3



	b	The Z parameters of a two-port network are Z_{11} = 10 Ω, Z_{22} = 15 Ω, Z_{12} = 5 Ω, Z_{21} = 5 Ω. Find the equivalent ABCD parameters.	5	3	2

UNIT-IV

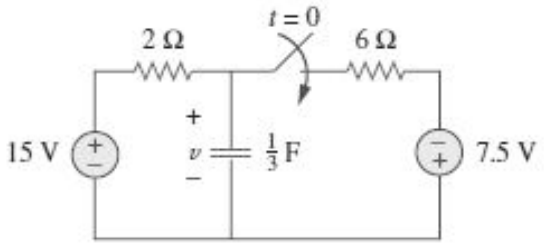
			Marks	CO	Blooms Level
7.	a	Define resonance in an electrical circuit. Derive the expression for the resonant frequency, bandwidth and quality factor in a series *R-L-C* circuit.	5	4	2
	b	In the circuit shown below *R*=8kΩ, *L*=0.2mH, *C* = 0.8μF. (a) Calculate ω_0, Q and Bandwidth (b) Calculate ω_1 and ω_2	5	4	3



(OR)

8.	a	A series-connected circuit has *R*=4Ω, *L*=25mH, Calculate the value of *C* that will produce a quality factor of 50. Calculate ω_1, ω_2 and Bandwidth. Determine the average power dissipated at $\omega=\omega_0$, ω_1 and ω_2. Take V_m=100V.	5	4	3
	b	A series connected *R-L-C* circuit has *R* = 4 Ω and *L* = 25mH. (a) Calculate the value of *C* that will produce a quality factor of 50. (b) Find ω_1 and ω_2 and susceptance *B*. Take the maximum voltage of the sinusoidal voltage to be 100 volts.	5	4	3

			Marks	CO	Blooms Level
		UNIT-V			
9.	a	Design a low pass constant *k*-filter with cut-off frequency of 4 kHz and nominal characteristic impedance of 500 Ω.	5	5	3
	b	Explain the classification of filters.	5	5	1
		(OR)			
10.	a	Explain the concept of M-Derived filters.	5	5	2
	b	Design an *m*- derived T-section high pass filter with a cut-off frequency of 2 khz, design impedance of 700 Ω and *m* =0.6.	5	5	3
		UNIT-VI	Marks	CO	Blooms Level
11.	a.	Derive the solution of a source free RL series circuit with the help of a neat circuit diagram.	5	6	2
	b	Find *v(t)* for *t*>0 in the circuit shown. Assume the switch has been open for a long time and is closed at *t* = 0. Calculate *v(t)* at *t* = 0.5 sec.	5	6	3



(OR)

12.	a	A series R –L Circuit with R =60 ohms and L = 30 H has a constant voltage V=120 V applied at t=0. Determine an expression for the current i.	5	6	3
	b	Derive an expression for the step response of an *R-C* series circuit.	5	6	2

AR20

CODE: 20MET205 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

II B.Tech.II Semester Regular/Supplementary Examinations, May,2023

APPLIED THERMO FLUIDS-II

(MECHANICAL ENGINEERING)

Time: 3 Hours **Max Marks: 60**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the Question must be answered at one place

			Marks	CO	Blooms Level
		UNIT-I			
1.	a	Discuss the effect of operating conditions on Rankine efficiency.	5	1	Analyzing
	b	Explain modified Rankine cycle with PV and TS plots.	5	1	Understanding
		(OR)			
2.		In a Rankine cycle, the steam at inlet to turbine is saturated at a pressure of 35 bar and the exhaust pressure is 0.2 bar. Determine pump work, turbine work, efficiency and condenser heat flow. Assume flow rate of 9.5 kg/s.	10	1	Applying
		UNIT-II			
3.		State the importance of water tube boilers and explain the working of Babcock and Wilcox water tube boiler with neat sketch.	10	2	Understanding
		(OR)			
4.		What are boiler accessories? Explain the functions of following accessories. (i) Superheater (ii) Economiser (iii) Injector (iv) Air Preheater	10	2	Understanding
		UNIT-III			
5.		Derive an expression for maximum discharge of the steam through a steam nozzle.	10	3	Analyzing
		(OR)			
6.		Enumerate the differences between Jet and Surface condensors.	10	3	Understanding
		UNIT-IV			
7.		The velocity of steam exiting the nozzle of the impulse stage of a turbine is 400m/s. The blades operate close to the maximum blading efficiency. The nozzle angle is 20%. Considering equiangular blades and neglecting blade friction, calculate for a steam flow of 0.6kg/s, the diagram power and the diagram efficiency.	10	4	Applying
		(OR)			
8.		Define Degree of reaction and explain pressure compounding and velocity compounding of steam turbines with the help of pressure – velocity diagrams.	10	4	Understanding
		UNIT-V			
9.		Derive an expression for air standard efficiency of closed Brayton cycle with PV and TS plots.	10	5	Analyzing
		(OR)			

10.	A gas turbine unit has a pressure ratio of 6:1 and maximum cycle temperature of 610°C. The isentropic efficiencies of the compressor and turbine are 0.80 and 0.82 respectively. Calculate the power output in kilowatts of an electric generator geared to the turbine when the air enters the compressor at 15°C at the rate of 16kg/s. Take c_p = 1.005 kJ/kg K and γ = 1.4 for the compression process, and take c_p = 1.11 kJ/kgK and γ = 1.333 for the expansion process.	10	5	Applying

UNIT-VI

11.	Explain any four psychrometric processes with the help of psychrometric chart and mention the Changes of properties in each process.	10	6	Understanding
	(OR)			
12.	In an air conditioning system air at a flow rate of 2 kg/s enters the cooling coil at 25°C and 50% RH and leaves the cooling coil at 11°C and 90% RH. The apparatus dew point of the cooling coil is 7°C. Find a) The required cooling capacity of the coil, b) Sensible Heat Factor for the process, and c) By-pass factor of the cooling coil. Assume the barometric pressure to be 1 atm. Assume the condensate water to leave the coil at ADP (hw = 29.26 kJ/kg)	10	6	Applying

AR18

CODE: 18BST205 **SET-2**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

II B.Tech II Semester Supplementary Examinations, May,2023

Probability and Statistics with R

(Common to CSE AND IT)

Time: 3 Hours **Max Marks: 60**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the Question must be answered at one place

UNIT-I

1. a) A random variable X has the following probability function: **6M**

X	0	1	2	3	4	5	6	7	8
P(x)	a	3a	5a	7a	9a	11a	13a	15a	17a

i) Find the value of a.
ii) Evaluate $P(X<3)$, $P(X\geq 3)$, $P(2\leq X<5)$
iii) Find the minimum value of x so that $P(X\leq x)>0.5$?

b) The probability that a pen manufactured by a company will be defective is 0.1. **6M**
If 12 such pens are manufactured, find the probability that
i) exactly two will be defective
ii) at least two will be defective
iii) none will be defective

(OR)

2. a) If a random variable takes the values 1,2,3 and 4 such that **6M**
$2.P(x=1) = 3.P(x=2) = P(x=3) = 5.P(x=4)$.
Find the probability distribution and cumulative distribution function of X

b) A car hire firm has two cars, which it hires out day by day. The number of demands **6M**
for a car on each day is distributed as a Poisson distribution with mean 1.5. Calculate
i) the proportion of days on which neither car is used.
ii) the proportion of days on which some demand is refused.

UNIT-II

3. a) The diameter of an electric cable, assumed to be a continuous random variable with **6M**
probability function $f(x)=6x(1-x)$; $0\leq x\leq 1$.
i) check whether f(x) is a probability density function
ii) determine b such that $P(x<b)=P(x\geq b)$

b) A sample of 100 dry battery cells tested to find the length of life has mean=12hours **6M**
with standard deviation=3 hours. Assuming the data to be normally distributed, what percentage of battery cells are expected to have life
i) more than 15 hours
ii) less than 6 hours
iii) between 10 and 14 hours

(OR)

4. a) If the probability density function of a random variable is given $f(x)=k(1-x^2)$, $0\leq x\leq 1$. **6M**
Find
i) the value of *k* ii) mean iii) variance

b) In a referendum 60% of voters voted in favour. A random sample of 200 voters was **6M**
selected. What is the probability that in the sample
i) more than 130 voted in favour
ii) between 105 and 130 inclusive voted in favour

UNIT-III

5. Samples of size two are taken from the population 2,3,4 and 5 with replacement. Find **12M**
   i) The population mean
   ii) The population standard deviation
   iii) Mean of the sampling distribution of means
   iv) Standard deviation of the sampling distribution of means

(OR)

6. a) If a one-gallon can of paint covers on the average 513.3 sq.ft. with a standard deviation of 31.5 sq.ft. What is the probability that the sample mean area covered by a sample of 40 of these one-gallon cans will be anywhere from 510 sq.ft and 520 sq.ft? **6M**

   b) If the average age at death of 64 men engaged in an occupation is 52.4 years with a standard deviation of 10.2 years, obtain 95% confidence interval for the mean age of all men in the population, assuming normality. **6M**

UNIT-IV

7. a) A sample of 10 boys had the following I.Qs. 70, 120, 110, 101, 88, 83, 95, 58, 107 and 110. Do these data support the assumption of a population mean I.Q of 100? Test at significant at $\alpha=0.05$. **6M**

   b) Two independent random samples of 8 and 7 items respectively have the values: **6M**

Sample 1	9	11	13	11	15	9	12	14
Sample 2	10	12	10	14	9	8	10	

   Test whether the difference between the variances is significant at 1% level of significance?

(OR)

8. Suppose 3 drying formulas for curing a glue are studied and the following times are observed. Carry out ANOVA one-way classification at 5% level of significance. **12M**

Formula A	13	10	8	11	8	
Formula B	13	11	14	14		
Formula C	4	1	3	4	2	4

UNIT-V

9. a) Fit a power curve of the form $Y= aX^b$ to the following data : **6M**

X	1	1.5	2	2.5	3	3.5	4
Y	1.1	1.3	1.6	2.6	2.7	3.4	4.1

   b) Find the Karl Pearson's correlation coefficient for the following data on heights of fathers (x) and their sons(y) measured in inches. **6M**

X	65	66	67	67	68	69	70	72
Y	67	68	65	68	72	72	69	71

(OR)

10. a) Fit a second degree parabola to the following data : **6M**

X	0	1	2	3	4
Y	1.0	1.8	1.3	2.5	6.3

    b) Find the regression lines to the given data: **6M**

X	2	5	3	4	9	12
Y	12	8	6	8	4	5

AR18

CODE: 18BST204 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

II B.Tech II Semester supplementary Examinations, May, 2023

Complex Variables and Statistical Methods

(CIVIL ENGINEERING)

Time: 3 Hours **Max Marks: 60**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the Question must be answered at one place

UNIT-I

1. a) Show that the complex function $f(z) = 2x^2 + y + i(y^2 - x)$is not analytic at any point. 6M

   b) The function $f(z) = z^2 = x^2 - y^2 + i2xy$ is entire. The functions u(x, y) = $x^2 - y^2$ and v(x, y) = 2xy are necessarily harmonic in any domain D of the Complex plane. 6M

(OR)

2. Construct the analytic function $f(z)$ by using Milne-Thomson method for which the real part is $e^x \cos y$. 12M

UNIT-II

3. a) Find the poles of the function $f(z) = \frac{5z+1}{(z-2)^2(z+3)(z-2)}$ 6M

   b) Find the residue at a pole of the function $f(z) = \frac{1}{(z-2)^2(z-3)}$ has simple pole at $z = 3$ and a pole of order 2 at $z = 1$ 6M

(OR)

4. a) Find the Removable singular point of the point $f(z) = \frac{\sin z}{z}$ 6M

   b) Evaluate the residue theorem of the function $\oint \frac{1}{(z-1)^2(z-3)} dz$, where the contour C is the rectangle defined by $x = 0, x = 4, y = -1, y = 1$. 6M

UNIT-III

5. a) With an eye toward improving performance, industrial engineers study the ability of scanners to read the bar codes of various food and household products. The maximum reduction in power, occurring just before the scanner cannot read the bar code at a fixed distance, is called the maximum attenuation. This quantity, measured in decibels, varies from product to product. After collecting considerable data, the engineers decided to model the variation in maximum attenuation as a normal distribution with mean 10.1 dB and standard deviation 2.7 dB.
   What is the probability that its maximum attenuation is between 8.5 dB and 13.0 dB? 6M

   b) Find the value of the finite population correction factor for n = 10 and N = 1,000. 6M

(OR)

6. a) Using Central limits theorem, Then show that If E is such that $P(|\bar{X} - \mu| < E) > 0.95$, then the minimum sample size n is given by $n = \frac{(1,.96)^2\sigma^2}{E^2}$, where μ and σ^2 are the mean and variance respectively of the population and $\bar{X}$ is the mean of the random sample. 6M

   b) A normal population has a mean of 0.1 and standard deviation of 2.1. Find the probability that mean of a sample of size 900 will be negative. 6M

UNIT-IV

7. a) Explain Test of Hypothesis 6M

b) The strength of steel wire made by an existing process is normally distributed with a mean of 1250 and a standard deviation of 150. A batch of wire is made by a new process, and a random sample consisting of 25 measurements gives an averagestrength of 1312. Assume that the standard deviation does not change. Is there evidence at the 1% level of significance that the new process gives a larger mean strength than the old? 6M

(OR)

8. The true probability that any oneComponent is defective has increased to 0.045. What is the probability of a Type IIerror? 12M

UNIT-V

9. Fit a straight line to the following data 12M

x	1	2	4	6
y	6	4	2	2

(OR)

10. a) Suppose that 50 units are placed on life test (without replacement) and the test is to be truncated after r = 10 of them have failed. We shall suppose, furthermore, that the first 10 failure times are 65, 110, 380, 420, 505, 580, 650, 840, 910, and 950 hours. Estimate the mean life of the component, and its failure rate, and calculate a 90% confidence interval for μ. 6M

b) The following are the average weekly losses of worker-hours due to accidents in 10 industrial plants before and after a certain safety program was put into operation 6M

Before:	42	73	46	124	33	57	83	34	26	17
After:	36	60	44	119	35	51	77	29	24	11

Use the 0.05 level of significance to test whether the safety program is effective. concerning losses of worker-hours before and after safety programs in 10 industrial plants. Calculater_s.

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AR18

CODE: 18ECT207 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

II B. Tech II Semester Supplementary Examinations, May,2023

ELECTRO MAGNETIC WAVES & TRANSMISSION LINES

(Electronics and Communication Engineering)

Time: 3 Hours **Max Marks: 60**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the Question must be answered at one place

UNIT-I

1.	a)	State and Prove the experimental law of Coulomb's Law	6M
	b)	Explain the electric field intensity due to infinite line charge density	6M
		(OR)	
2.	a)	Explain Maxwell's Two Equations for Electrostatic Fields	6M
	b)	Illustrate Poisson's and Laplace's Equations.	6M

UNIT-II

3.	a)	Explain H field at point P due to a straight filamentary conductor	6M
	b)	A circular loop located at $X^2+Y^2 = 9$, Z=0 carries a direct current of 10A along a_φ. Determine H at (0,0,4) and (0,0,-4).	6M
		(OR)	
4.	a)	Explain Ampere's law applied to an infinite filamentary line current	6M
	b)	Derive the equation of Force on moving charge due to electric and magnetic fields	6M

UNIT-III

5.	a)	Write down Maxwell's equations in differential form and integral form	6M
	b)	What is the Faraday's law of induction and derive an expression in point form	6M
		(OR)	
6.	a)	Derive the boundary conditions for the tangential and normal components of Electrostatic fields at the boundary between two perfect dielectrics.	8M
	b)	Explain about Inconsistency of ampere's law.	4M

UNIT-IV

7.	a)	Derive the expression for an EM wave incident obliquely on a dielectric with perpendicular polarization	6M
	b)	Define Uniform plane waves and obtain the relation between E&H.	6M
		(OR)	
8.	a)	Describe Polarization in detail	6M
	b)	State and prove poynting theorem.	6M

UNIT-V

9.	a)	Derive the general transmission line equation in detail	8M
	b)	Explain the condition of a distortionless line	4M
		(OR)	
10.	a)	Define input impedance of a transmission line and derive the expression for it	6M
	b)	Discuss the stub matching techniques of impedance matching.	6M

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AR18

CODE: 18MET204 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

II B. Tech II Semester Supplementary Examinations, May,2023

STRENGTH OF MATERIALS

(Mechanical Engineering)

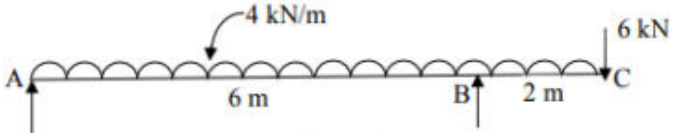
Time: 3 Hours **Max Marks: 60**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the Question must be answered at one place

UNIT-I

1.	a)	Draw the stress strain curve for mild steel mark the salient features	6M
	b)	A straight bar 500mm long is 25 mm diameter for 300 mm length and 15 mm diameter for the remaining length. If the bar is subjected to an axial pull of 15 kN, find the extension of the bar. Take E = 200 Gpa.	6M
		(OR)	
2.	a)	Define (i) longitudinal strain, (ii) lateral strain and (iii) Poisson's ratio	6M
	b)	A steel bar is placed between two copper bars of same area and length at a temp of 150C. At this stage, they are rigidly connected together at both ends. When the temperature is raised to 3150 C, the length of bars increase by 1.6 mm. Find the original length and stresses in bars. Take Es = 200 Gpa, Ec = 100 Gpa, αs = 0.000012 per 0C, αe = 0.000018 per 0C.	6M

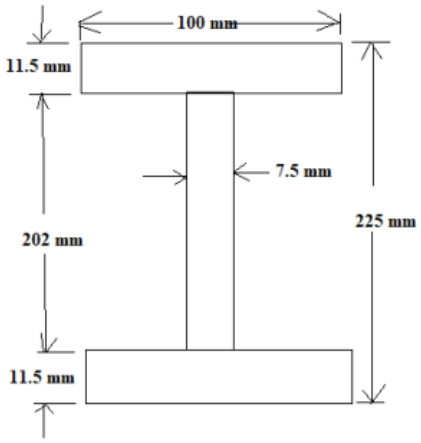
UNIT-II

3.	a)	Derive the expressions for the circumferential stress and longitudinal stress for thin cylindrical shell subjected to internal pressure 'p'.	6M
	b)	A thin cylinder 75 mm internal diameter, 250 mm long with walls 2.5 mm thick is subjected to an internal pressure of 7 MN/m2 .Determine the change in internal diameter and the change in length. If, in addition to the internal pressure, the cylinder is subjected to a torque of 200 N m, find the magnitude and nature of the principal stresses set up in the cylinder. E = 200 GN/m2 ,μ = 0.3.	6M
		(OR)	
4.	a)	What do you understand by term 'Point of contra flexure'? Explain with reasons if it exists in a cantilever beam, simply supported beam, and an overhanging beam.	4M
	b)	An overhanging beam is shown in figure. Draw the S.F and B.M diagrams. 	8M

UNIT-III

5. a) Derive the bending equation from fundamentals M/I= f/y = E/R 6M

   b) An I- section beam, shown in fig.4, is simply supported over a span of 10 metres. If the maximum permissible bending stress is 80 N/mm2 . What concentrated load can be carried at a distance of 3.50 metres from one support? 6M



(OR)

6. A T – section beam with 100 mm x 15 mm flange and 150 mm x 15 mm web is subjected to a shear force of 12 kN at a section. Draw the variation of shear stress across the depth of the beam and obtain the value of maximum shear stress of the section. 12M

UNIT-IV

7. a) Derive an expression for the Euler's critical buckling load of a column with Clamped- Clamped ends. 4M

   b) Two shafts of the same material are subjected to the same torque. If the first shaft is of solid circular section and the second shaft is of hollow section whose internal diameter is $^2/_3$ rd of the external diameter, compare the weights of the two shafts. 8M

(OR)

8. Derive the Torsion equation and list out the assumptions? 12M

UNIT-V

9. a) What are the limitations of the moment area method? 6M

   b) Find the maximum slope and deflection of a cantilever beam, when loaded with uniformly distributed load? 6M

(OR)

10. A simply supported beam of span 5 m, carrying a point load of 5 kN at a distance of 3 m from the left end. Find (i) slope at the left support, (ii) deflection under the load and (iii) maximum deflection. Take E= 2x105 N/mm2 and I = 1x108 mm4 .Use double integration method. 12M

AR18

CODE: 18EST103 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

II B.Tech II Semester Supplementary Examinations, May,2023

ENGINEERING MECHANICS

(ELECTRICAL AND ELECTRONICS ENGINEERING)

Time: 3 Hours **Max Marks: 60**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the Question must be answered at one place

UNIT-I

1. a) The forces 20 N, 30 N, 40 N, 50 N and 60 N are acting at one of the angular points of a regular hexagon, towards the other five angular points, taken in order. Find the magnitude and direction of the resultant force. 10

   b) Classify the systems of forces. 2

(OR)

2. a) With a suitable example explain how the resultant of coplanar concurrent forces is calculated. 10

   b) State the principle of moments. 2

UNIT-II

3. a) A 675 N man stands on the middle rung of a 225 N ladder, as shown in Fig.1. Assuming a smooth wall at B and a stop at A to prevent slipping, find the reactions at A and B. 10

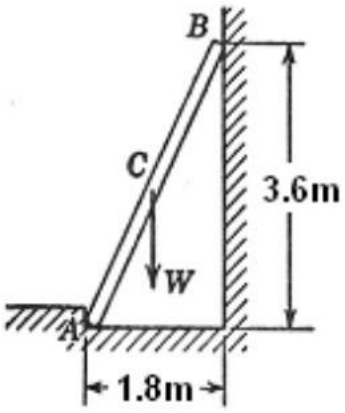


Fig.1.

   b) State and prove Varignon's theorem. 2

(OR)

4. a) Find the reactions R_a and R_b induced at the supports A and B of the right angle bar ACB supported as shown in Fig.2. and subjected to a vertical load P applied at the mid-point of AC. 10

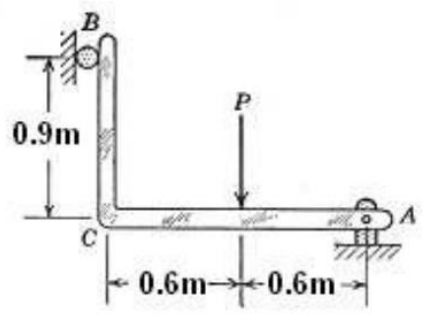


Fig.2.

   b) Define a couple-moment and list its characteristics. 2

UNIT-III

5. Find the force required to move a load of 300 N up a rough inclined plane, the force being applied parallel to the plane. The inclination of the plane is such that when the same body is kept on a perfectly smooth plane inclined at that angle, a force of 60 N applied at an inclination of 30° to the plane keeps the same in equilibrium. Assume that co-efficient of friction between the rough plane and load is equal to 0.3. 12

(OR)

6. Determine the forces in all the members of the truss shown in Fig. 3. and indicate the magnitude and nature of forces on the diagram of the truss. All inclined members are at 60° to horizontal and length of each member is 2 m. 12

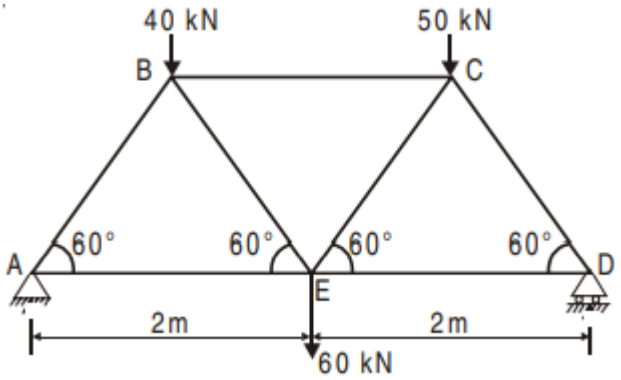


Fig. 3.

UNIT-IV

7. a) Find the moment of inertia about the centroidal axes of the section shown in Fig. 4. 8

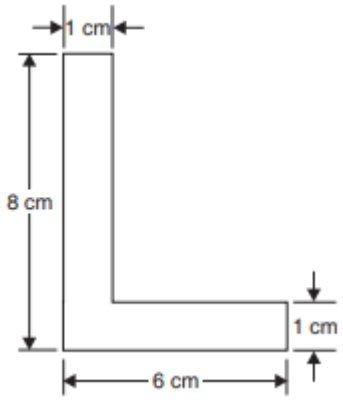


Fig. 4.

b) Discuss the procedure to find the location of the centre of gravity of a composite body. 4

(OR)

8. a) State and prove transfer formula for product of inertia. 6
   b) Determine the centroid of the lamina shown in Fig. 5. 6

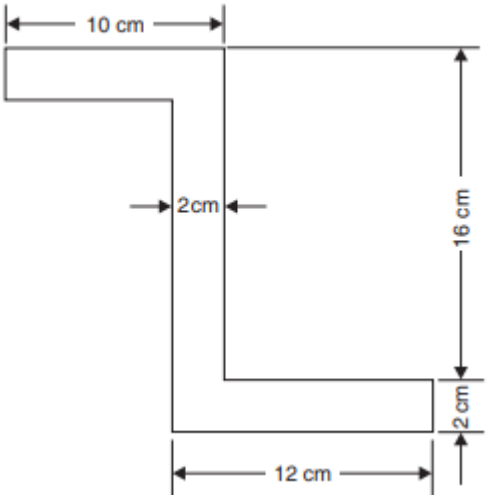


Fig. 5.

UNIT-V

9. a) What is the difference between Newton's Second law and D'Alembert's principle. 2

   b) Find the acceleration of the moving loads as shown in Fig.6. Take mass of P=120 kg and that of Q=80 Kg and coefficient of friction between surfaces of contact is 0.3. Also find the tension in the connecting string. 10

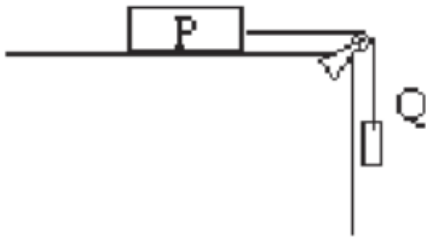


Fig.6.

(OR)

10. a) A body moves along a straight line and its acceleration 'a' which varies with time 't' is given by a =2-3t. Five seconds after the start of observation, the velocity is 20 m/s. The distance moved by the body 10sec after the start of observation of motion from origin is 85 m. 10

   Determine the following:

   i). The acceleration, velocity and distance from the origin at the start of observation.

   ii). The time after the start of observation at which the velocity becomes zero and the distance travelled from the origin.

   b) A food packet is dropped from a plane going at an altitude of 1000m, what is the path of packet as seen from plane? What is the path as seen from the ground? What will be the actual path? 2

AR16

CODE: 16EC2008 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

II B.TECH II SEM SUPPLEMENTARY EXAMINATIONS, MAY,2023

ELECTROMAGNETIC FIELD THEORY AND TRANSMISSION LINES

(ELECTRONICS AND COMMUNICATION ENGINEERING)

Time: 3 Hours **Max Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the Question must be answered at one place

UNIT-I

1. a) State and prove the Gauss law 7M
   b) Explain briefly about charge distributions 7M

(OR)

2. a) Define Electric potential and derive the relationship between electric potential and electric field. 10M
   b) Define capacitance. Find the capacitance of a parallel plate capacitor with dielectric mica filled between the plates ' ε_r 'of the mica is 6 .The plates of capacitor are in shape with 0.254 cm side, separation between the two plates is 0.254 cm. 4M

UNIT-II

3. a) Define Magnetic flux density, scalar and vector magnetic potential 10M 10M
   b) Find the total magnetic flux crossing a surface, $\varphi = \pi/2$, $1 \leq \rho \leq 2$ and $0 \leq z \leq 5$ m due to a vector magnetic potential $A = (-\rho^2/4)$ a_z Webers/m 4M

(OR)

4. a) Define Biot-Savart's law for Distributed currents 10M 10M
   b) A plane wave is propagating in a medium having the properties $\mu = 4; \varepsilon = 36; \sigma = 1$ s/m and $E = 100\ e^{-\alpha z}\cos(10^8 t - \beta z)a_x$ V/m, Determine the associated magnetic field. 4M

UNIT-III

5. a) Derive expressions for induced EMF in an AC generator for both steady and varying magnetic field 7M
   b) Explain Modified Ampere's Circuital Law for Time-Varying Fields. 7M

(OR)

6. a) Write the ratio between Conduction Current Density and Displacement Current Density? 10M

b) What is Displacement Current? Moist soil has a conductivity of 10^{-3} siemens/m and $\varepsilon_r = 2.5$. Find J_c and J_d where, $E = 6 \times 10^{-6} \sin(9 \times 10^9 t)$ V/m. 4M

UNIT-IV

7. a) Write Expressions for α and β for a Conducting Medium 10M

b) A conductor ($\sigma = 10$ S/m, $\varepsilon_r = \mu_r = 1$) support a uniform plane wave at 60 GHz. Compute the attenuation constant, propagation constant, intrinsic impedance, wavelength and phase velocity of propagation. 4M

(OR)

8. a) Discuss about reflection and refraction of plane waves for oblique incidence with E perpendicular to the plane of incidence. 10M

b) A uniform plane wave propagating in a medium has $E = 2e^{-\alpha z}(\sin(10^8 t - \beta z)a_y$ V/m. If medium is characterized by $\varepsilon_r = 1$, $\mu_r = 20$, $\sigma = 3$mhos/m, find α and β. 4M

UNIT-V

9. a) Derive input impedance of Open and Short transmission lines. 10M

b) A transmission line 100 km long gave the following results for an impedance measurement at 1796 Hz. $Z_{oc} = 328 \angle -29.2^0$ and $Z_{sc} = 1548 \angle 6.8^0$. Determine the line constants. 4M

(OR)

10. a) Derive the relation between Reflection coefficient and Characteristic impedance of a transmission line. 10M

b) A 100Ω loss less line connects a signal of 100 KHz to load of 140 Ω. The load power is 100mW.Calculate (i) Voltage reflection coefficient (ii) VSWR (iii) Position of Vmax, Imax, Vmin and Imin. 4M

AR13

CODE: 13EC2011 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
II B.TECH II SEM SUPPLEMENTARY EXAMINATIONS, MAY,2023

ELECTROMAGNETIC WAVES AND TRANSMISSION LINES
(ELECTRONICS AND COMMUNICATION ENGINEERING)

Time: 3 Hours **Max Marks: 70**

PART-A

ANSWER ALL QUESTIONS **[1 x 10 = 10 M]**

1. a) State and explain Faraday's law for induced e.m.f.
   b) Write the poynting theorem.
   c) Define Linear homogeneous medium. And list its properties?
   d) Explain different losses existed in Transmission lines.
   e) Define reflection coefficient?
   f) What is e.m.f? Explain.
   g) Define Distortion less transmission line and explain the condition with necessary mathematical expressions.
   h) What are different applications of smith chart?
   i) Discuss about infinite lines
   j) Sketch the input impedance of a lossless line for shorted and open circuited conditions.

PART-B

Answer one question from each unit **[5x12=60M]**

UNIT-I

2. a) State the Coulomb's law of force between any two point charges and indicate the units of the quantities in the force equation. 8M
   b) Explain gauss law and its applications 4M

(OR)

3. a) Derive Poisson's and Laplace's equations starting from Gauss law. 8M
   b) Find the force on a 100μC charge at (0, 0, 3) m, if four like charges of 20 μC are located on x, y axis at ±4m. 4M

UNIT-II

4. a) Explain about Magnetic Field Intensity due to an Infinitely Long Conductor 8M
   b) Find the magnetic field intensity at point P(2,2,3) caused by a current filament of 25 A in the a_z direction and extending from z = 0 to z =6 4M

(OR)

5. a) Explain about Magnetic Field Intensity along the Axis of a Circular Loop 8M
   b) A steady current of 10 A is established in a long straight hollow aluminium conductor which has an inner and outer radius of 1.5 cm and 3 cm respectively. Find the value of B as function of radius. 4M

UNIT-III

6. a) Explain the equation of continuity in time varying fields 8M
   b) A certain material has $\sigma = 0$, $\varepsilon_r = 1$, if $H = 4 \sin(106t - 0.01z)$ ay A/m. Find μr using Maxwell's equations. 4M

(OR)

7. a) Explain Modified Ampere's Circuital Law for Time-varying Fields. 8M
   b) Find the frequency at which conduction current density and displacement current density are equal in a medium with $\sigma = 2 \times 10^{-4}$ mho/m and $\varepsilon_r = 81$. 4M

UNIT-IV

8. a) Discuss about reflection and refraction of plane waves for oblique incidence with E perpendicular to the plane of incidence. 8M
   b) An elliptically polarized wave in air has x and y components: $Ex = 4 \sin(wt - \beta z)$ V/m $Ey = 8 \sin(wt - \beta z + 750)$ V/m. Find the poynting vector. 4M

(OR)

9. a) Define Brewster angle and derive an expression for Brewster angle when a wave is parallelly polarized. 6M
   b) Derive the expression for surface impedance of a conductor. 6M

UNIT-V

10. a) List out types of transmission lines and draw their schematic diagrams and Describe the losses in transmission lines. 8M
    b) A transmission line in which no distortion is present has the following parameters: $Zo = 60\Omega$, $\alpha = 20$ mNP/m, $V = 0.7V0$. Determine R, L, G, C and wavelength at 0.1GHz 4M

(OR)

11. a) Explain how Quarter wave transformer acts as impedance inverter 8M
    b) A 100Ω loss less line connects a signal of 100 KHz to load of $140\ \Omega$. The load power is 100mW.Calculate (i) Voltage reflection coefficient (ii) VSWR (iii) Position of Vmax, Imax, Vmin and Imin. 4M

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