

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

Marks CO BTL

- | | | | | | |
|----|----|--|----|---|----|
| 1. | a) | Find the probability of getting the sum 6 exactly 3 times in 7 throws with a pair of fair dice. | 7M | 1 | L1 |
| | b) | A manufacturer knows that the condensers he makes contain on average 1% defectives. He packs them in boxes of 100. What is the probability that a box picked at random will contain 3 or more faulty condensers? | 7M | 1 | L1 |

(OR)

- | | | | | |
|----|--|-----|---|----|
| 2. | In a normal distribution 31% of the items are under 45 and 8% are over 64. Find the mean and variance of the distribution. | 14M | 1 | L1 |
|----|--|-----|---|----|

UNIT-II

- | | | | | | |
|----|----|--|----|---|----|
| 3. | a) | If we can assert with 95% that the maximum error is 0.05 and $P=0.2$, then build the size of the sample. | 7M | 2 | L3 |
| | b) | The mean and standard deviation of a population are 11,795 and 14,054 respectively. What can one assert with 95% confidence about the maximum error if $\bar{x} = 11,795$ and $n = 50$. And also construct 95% confidence interval for the true mean. | 7M | 2 | L3 |

(OR)

- | | | | | |
|----|---|-----|---|----|
| 4. | A population consists of four numbers 2, 3, 4, 5. Consider all possible distinct samples of size two with replacement. Construct (i) the population mean (ii) the population standard deviation (<i>s.d.</i>) (iii) the sampling distribution of means (iv) the mean of the S.D. of means (v) <i>s.d.</i> of S.D. of means. | 14M | 2 | L3 |
|----|---|-----|---|----|

UNIT-III

5. In a survey of buying habits, 400 women shoppers are chosen at random in supermarket “A” located in a certain section of the city. Their average weekly food expenditure is Rs. 250 with a S.D of Rs. 40. For 400 women shoppers chosen at random in supermarket ‘B’ in another section of the city, the average weekly food expenditure is Rs. 220 with a S.D. of Rs. 55. Test at 1% level of significance whether the average weekly food expenditure of the populations of shoppers is equal. 14M 3 L3

(OR)

6. A die was thrown 9000 times and of these 3220 yielded a 3 or 4. Is this consistent with the hypothesis that the die was unbiased? 14M 3 L3

UNIT-IV

7. The mean lifetime of a sample of 25 fluorescent light bulbs produced by a company is computed to be 157 hours with a S.D. of 120 hours. The company claims that the average life of the bulbs produced by the company is 1600 hours using the level of significance of 0.05. Is the claim acceptable? 14M 4 L3

(OR)

8. The number of automobile accidents per week in a certain community are as follows: 12,8,20,2,14,10,15,6,9,4. Are these frequencies in agreement with the belief that accident conditions were the same during this 10-week period. 14M 4 L3

UNIT-V

9. For the following data determine (i) least squares regression line of y on x (ii) y (3) (iii) least squares regression line of x on y (iv) x (4). 14M 5 L5

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

(OR)

10. Determine the rank correlation for the following data: 14M 5 L5

X :	56	42	72	36	63	47	55	49	38
	42	68	60						
Y :	147	125	160	118	149	128	150	145	115
	140	152	155						

**UNIVERSAL HUMAN VALUES
(Common to CE, EEE, ME, ECE)****Time: 3 Hours****Max Marks: 70**

Answer ONE Question from each Unit

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All parts of the Question must be answered at one place

		Marks	CO	Blooms Level
<u>UNIT-I</u>				
1.	a) What are the basic guidelines for value education?	7	1	K2
	b) What is happiness and prosperity? Are they related to each other? Can happiness be obtained without prosperity? Explain.	7	1	K2
(OR)				
2.	a) What is the need for value education? Write a short note on the need for value education in today's scenario.	7	1	K2
	b) Illustrate the purpose of self-exploration?	7	1	K2
<u>UNIT-II</u>				
3.	a) Differentiate between the needs of self and the needs of body.	7	2	K2
	b) Explain how activities in self (I) are inter related?	7	2	K2
(OR)				
4.	a) In what way can we say that the human body is a self-organised unit?	7	2	K2
	b) What are the programs for ensuring the health of the body? Explain.	7	2	K2
<u>UNIT-III</u>				
5.	a) Enumerate some of the important values which lie at the base of good relationships.	7	3	K2
	b) What is the role of value system in family harmony? How can you maintain harmony in relationship?	7	3	K2
(OR)				
6.	a) Difference between respect and differentiation.	7	3	K2
	b) Explain the problems faced due to differentiation in relationship.	7	3	K2
<u>UNIT-IV</u>				
7.	a) Explain how there is recyclability and self-regulation in nature.	7	4	K2
	b) Define existence? Show that existence is in a form of co-existence.	7	4	K2
(OR)				
8.	a) What are the four orders in nature? Describe their activities and natural characteristics?	7	4	K2
	b) Explain the concept of holistic perception of harmony in existence.	7	4	K2
<u>UNIT-V</u>				
9.	a) What do you mean by competence in professional ethics?	7	5	K2
	b) What do you mean by definitiveness of ethical human conduct? How can it be ensured?	7	5	K2
(OR)				
10.	a) What are the values in interaction of human beings with the material things?	7	5	K2
	b) Critically examine the issues in professional ethics in the current scenario.	7	5	K2

**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

<u>UNIT-I</u>		Marks	CO	Blooms Level
1.	In a regenerative cycle, the steam pressure at turbine inlet is 30bar and the exhaust is at 0.04bar. The steam is initially saturated. Enough steam is bled off at the optimum pressure to heat the feed water. Determine the cycle efficiency. Neglect pump work.	10	1	Apply
(OR)				
2.	Describe the various operations of a Rankine cycle. Derive its expression for the thermal efficiency.	10	1	Understand
<u>UNIT-II</u>		Marks	CO	Blooms Level
3. a.	Discuss the necessity of mountings in boilers? Name different mountings and give functions of each.	5	2	Understand
b.	Explain the circumstances the water tube boilers are used in preference to the fire tube boilers, Give reasons in support of your answer.	5	2	Understand
(OR)				
4.	Explain the working and understanding of a feed check valve with a neat sketch.	10	2	Understand
<u>UNIT-III</u>		Marks	CO	Blooms Level
5. a.	Identify the effects of air leakage on the performance of a condenser.	5	3	Understand
b.	Describe the factors which influence the efficiency of a condensing plant.	5	3	Understand
(OR)				
6.	Explain with help of h-s diagram the effect of friction on flow through a steam nozzle.	10	3	Apply
<u>UNIT-IV</u>		Marks	CO	Blooms Level
7. a.	Explain the working of a single-stage impulse turbine. Sketch pressure and velocity variations along the axis of the turbine.	5	4	Understand
b.	Differentiate between impulse and reaction turbines	5	4	Understand
(OR)				
8.	In a reaction turbine, the fixed blades and moving blades are of same shape but reversed in direction. The angles of the receiving tips are 35° and of the discharging tips are 20° . Find the power developed per pair of blades for a steam consumption of 2.5 kg/s, when the blade speed is 50m/s. If the heat drop per pair is 10.04 kJ/kg, find the efficiency of the pair.	10	4	Analyse

<u>UNIT-V</u>		Marks	CO	Blooms Level
9.	a. Discuss briefly the methods employed for the improvement of thermal efficiency of an open cycle gas turbine plant.	5	5	Understand
	b. Explain the line diagram of a semi closed gas turbine plant.	5	5	Understand

(OR)

10.	In a simple gas turbine plant, air enters at 1 bar and 20°C and compressed with isentropic efficiency of 80% to 4bar. Then it is heated in combustion chamber with A:F ratio=90:1. The Calorific value of a fuel used is 41.8 MJ/kg. If air flow is 3kg/sec, find the power developed and thermal efficiency by the plant. Take $C_p = 1 \text{ kJ/kg } ^\circ\text{C}$ and $\gamma = 1.4$ for air as well as gas.	10	5	Apply
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<u>UNIT-VI</u>		Marks	CO	Blooms Level
11.	a. Define thermodynamics of human body temperature control.	5	6	Understand
	b. Define: RSHF, GSHF and ESHF. Explain the procedure to draw the lines of RSHF, GSHF and ESHF on Psychrometric Chart.	5	6	Understand

(OR)

12.	Explain with example factors contributing to Cooling Load. How the Infiltration Load is estimated?	10	6	Understand
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2 of 2

Time: 3 Hours

Max Marks: 60

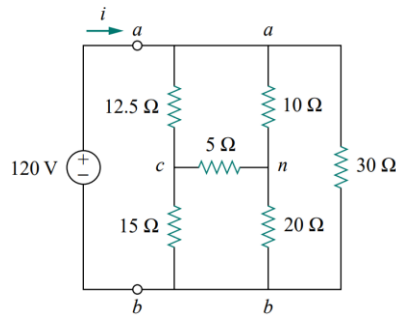
Answer ONE Question from each Unit

All Questions Carry Equal Marks

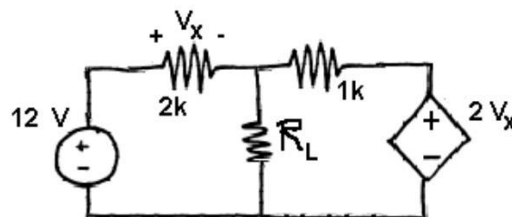
All parts of the Question must be answered at one place

UNIT-I

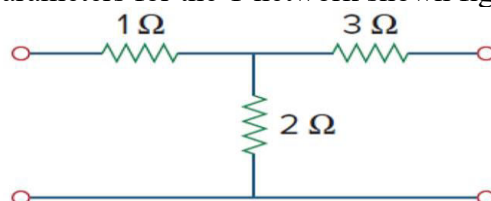
- | | | Marks | CO | Blooms Level |
|------|--|-------|----|--------------|
| 1. | a Explain Kirchoff's current law and Kirchoff's voltage law with an example. | 4M | 1 | 1 |
| | b State and Explain Thevenins theorem. | 6M | 1 | 3 |
| (OR) | | | | |
| 2. | a State and explain Superposition Theorem with suitable example. | 5M | 1 | 1 |
| | b Calculate the equivalent resistance R_{ab} in the circuit below: | 5M | 1 | 3 |

**UNIT-II**

- | | | Marks | CO | Blooms Level |
|------|--|-------|----|--------------|
| 3. | a State and explain Reciprocity Theorem with suitable example. | 4M | 2 | 2 |
| | b State and explain Maximum power transfer theorem. | 6M | 2 | 3 |
| (OR) | | | | |
| 4. | a State and explain Millman's Theorem with suitable example. | 4M | 2 | 2 |
| | b Find the value of R_L for maximum power Transfer. | 6M | 2 | 3 |

**UNIT-III**

- | | | Marks | CO | Blooms Level |
|----|--|-------|----|--------------|
| 5. | Obtain the Z parameters for the T network shown figure | 10M | 3 | 2 |



(OR)

6.	Prove the condition of reciprocity for ABCD parameters.	10M	3	3
<u>UNIT-IV</u>		Marks	CO	Blooms Level
7.	Define bandwidth, derive the condition for resonant frequency for series RLC circuit.	10M	4	3
(OR)				
8.	Develop Locus diagrams for Series RLC circuit When i) X_C is varied ii) f is varied.	10M	4	3
<u>UNIT-V</u>		Marks	CO	Blooms Level
9.	Write short note on a) m-derived Low Pass filters b) m-derived High Pass Filters.	10M	5	3
(OR)				
10.	Explain about Low Pass filters, High Pass Filters, Band Pass Filters, Band Elimination Filter.	10M	5	3
<u>UNIT-VI</u>		Marks	CO	Blooms Level
11.	Derive the transient response of series RL circuit for DC.	10M	6	3
(OR)				
12.	In a series R-L circuit, the application of a direct voltage results a steady state current of $0.632I$ in 1 second. I being the final steady state value of the current. However, after the current has reached its final value, a sudden short circuit is applied against the source. What would be the value of the current after one second?	10M	6	2

ENGINEERING MECHANICS
(ELECTRICAL AND ELECTRONICS ENGINEERING)

Time: 3 Hours

Max Marks: 60

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UNIT-I

Marks	CO	Blooms Level
[6M]	1	L3

1. a) Four coplanar forces are acting at a point as shown in Fig. One of the forces is unknown and its magnitude shown by P. If the resultant acting along the X-axis is 500N, determine the unknown force and its direction.

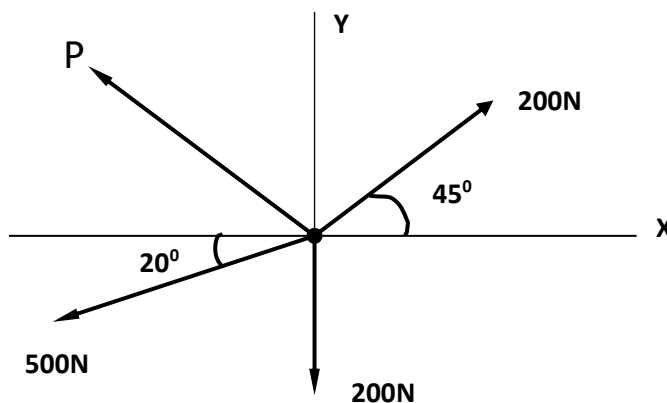


Fig.01

- b) State and prove the Lame's theorem 4M 1 L2

(OR)

2. a) State and explain the Free body diagram with neat sketch 4M 2 L2
 b) An electric light fixture weighing 20 N hangs from a point C, by two strings AC and BC. AC is inclined at 60° to the horizontal and BC at 30° to the vertical as shown in Fig.02. Using Lame's theorem or otherwise determines the forces in the strings AC and BC. [7M] 6M 1 L3

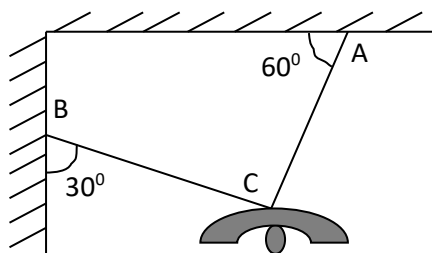


Fig.02

UNIT-II

Marks	CO	Blooms Level
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3. State and prove the varignon's theorem
- A rigid bar AB is supported in a vertical plane and carries a load Q at its free end as shown in figure. Neglecting the weight of the bar itself, compute the magnitude of the tensile force S induced in the horizontal string CD.

4M

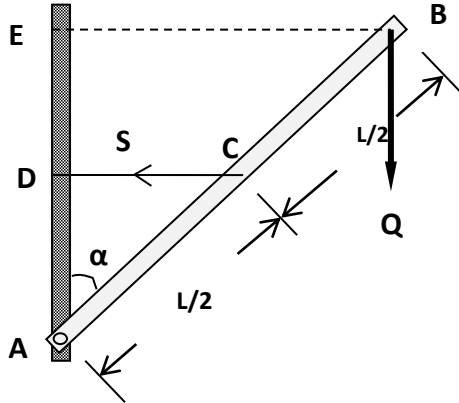
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L2

6M

2

L3



(OR)

4. Two smooth circular cylinders, each of weight $W = 100 \text{ kg}$ and radius $r = 15 \text{ cm}$ are connected at their ends by a string AB of length $l = 40 \text{ cm}$ and rest upon a horizontal plane, supporting above them a third cylinder of weight $Q = 200 \text{ kg}$ and radius $r = 15 \text{ cm}$ as shown in fig.6. Evaluate the tensile force S in the string AB and the pressure produced on the floor at points of contact D & E.

10M

2

L3

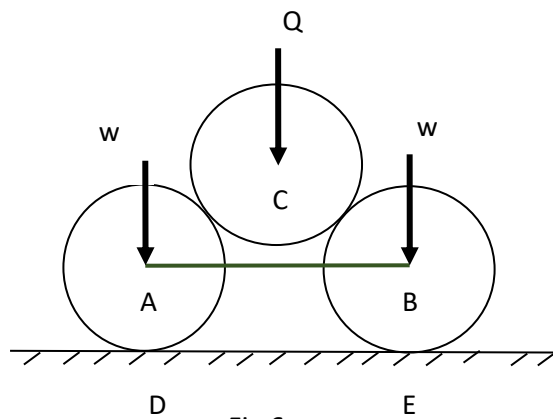
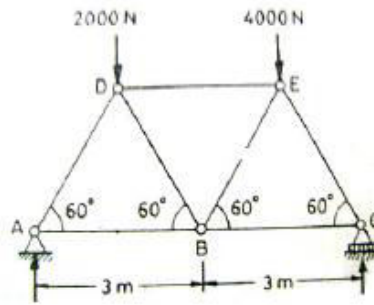


Fig.6

UNIT-III

Marks	CO	Blooms Level
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5. a) what is the advantage of method of section over the method of joints? 3M 3 L2
- b) Determine the axial forces induced in the all the members of the truss shown in figure. 7M 3 L3



(OR)

6. A uniform ladder 4 m long and weighing 10kg is placed with one end on the ground and the other against a vertical wall. The coefficient of static friction for all contact surfaces is 0.3. Find the minimum value of the angle θ at which the ladder can be inclined with the horizontal before slipping occurs. 10M 3 L3

UNIT-IV

Marks	CO	Blooms Level
-------	----	--------------

7. a) State and explain parallel axis theorem. 4M 4 L2
- b) Determine the the moment of Inertia of the shaded area obtained by cutting a semi circle of diameter 'a=60 mm' from the quadrant of a circle of radius 'a=60mm' as shown in Fig.04. 6M 4 L4

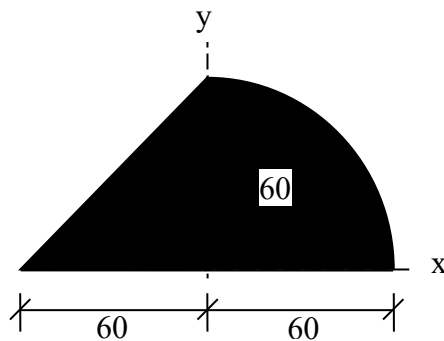
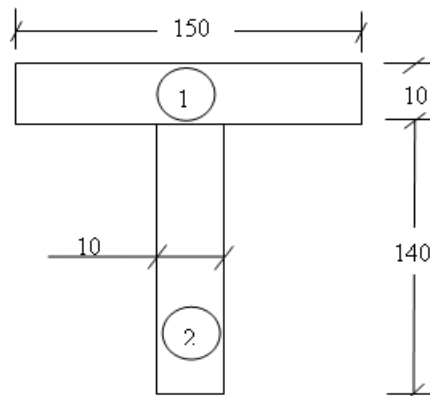


Fig. 04

(OR)

8. Determine the centroid of the T-section shown in Fig. about its centroidal axis. 10M 4 L3



UNIT-V

Marks	CO	Blooms Level
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9. The angular displacement of a flywheel is given by $\alpha = 12 - t$ where α is rad/sec and 't' is in seconds. If the angular velocity of the flywheel is 60 rad/sec at the end of 4 seconds, determine the angular velocity at the end of 6 seconds. How many revolutions take place in these 6 second's?

(OR)

10. A ball is dropped from the top of a tower 30M height. At the same instant a second ball thrown up from the ground with initial velocity of 15 m/sec. When and where do they cross each other and with what relative velocity?

UNIT-VI

Mark s	C O	Bloom s Level
--------	-----	---------------

11. Neglecting friction and inertia of the two-step pulley as shown in Fig.7, find the acceleration 'a' of the following weight 'P'. Assume $P=4\text{kg}$, $Q=6\text{kg}$ and $r_2 = 2r_1$

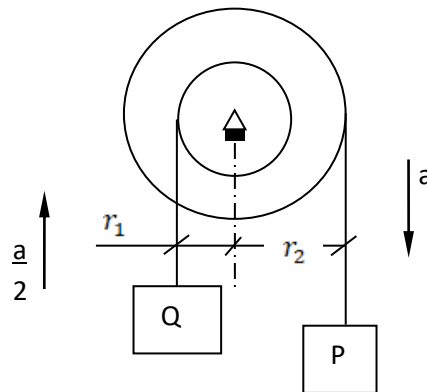
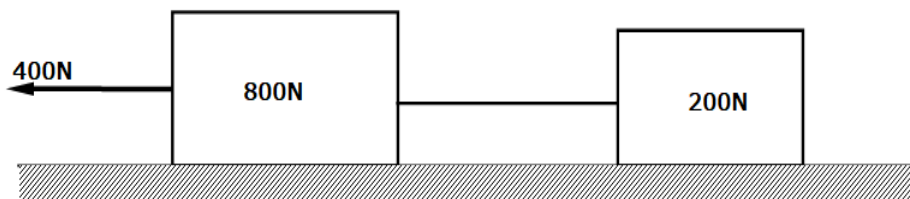


Fig. 7.

(OR)

12. Two weights 800 N and 200 N are connected by a thread and move along a rough horizontal plane under the action of a force 400N, applied to the first weight of 800N as shown in Fig.. The coefficient of friction between the sliding surfaces of the weights and the plane is 0.3. Determine the acceleration of the weights and the tension in the thread using work-energy equation.



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UNIT-I

1. a A random variable X has the following probability function:

X:	0	1	2	3	4	5	6	7
P(x):	0	k	2k	2k	3k	k ²	2k ²	7k ² +k

Marks

CO

BTL

5

CO1

i. Find k

ii. Evaluate $P(X < 6)$, $P(X \geq 6)$, $P(3 < X \leq 6)$ iii. Find the minimum value of x so that $P(X \leq x) > 1/2$.

- b If the probability that a new-born child is a male is 0.6, find the probability that in a family of 5 children there are exactly 3 boys.

5

CO1

(OR)

2. a A player tosses two unbiased coins, he wins Rs.5 if two heads appear, Rs.2 if one head appear and Rs.1 if no head appear. Find the expected profit.

5

CO1

- b Assume that the probability of a coal miner being killed in a mine accident during a year is
- $1/2400$
- . Use Poisson distribution to calculate the probability that in a mine employing 200 miners there will be at least one fatal accident in a year.

5

CO1

UNIT-II

3. a Given
- $f(x) = kx^2$
- ,
- $0 < x < 3$

Marks

CO

BTL

5

CO2

i. Find the distribution function

ii. $P(1 < x \leq 2)$

- b A sample of 100 dry battery cells tested to find the length of life produced the mean=12 hours and standard deviation= 3 hours. Assuming the data to be normally distributed, what percentage of battery cells are expected to have life

5

CO2

i. more than 15 hours

ii. less than 6 hours

iii. between 10 and 14 hours.

(OR)

4. a Let x is a random variable with density function
- $f(x) = \frac{x^3}{3}$
- ,
- $-1 < x < 2$

5

CO2

i. Find the expected value of $4x+3$ ii. Variance of $2x+1$

- b In a normal distribution, 7% of the items are under 35 and 89% are under 63. Find the mean and standard deviation of the distribution.

5

CO2

UNIT-III

5. A population consists of five numbers 3,6,9,15 and 27. Consider all possible samples of size 2 that can be drawn with replacement from the population. Obtain

Marks

CO

BTL

10

CO3

(a) The mean of the population.

(b) The standard deviation of the population.

(c) The mean of the sampling distribution of means

(d) The standard deviation of sampling distribution of means

(OR)

6. a A random sample of size 100 is taken from a population having the mean
- $\mu=76$
- and variance
- $\sigma^2=256$
- . What is the probability that
- \bar{X}
- will be between 75 and 78?

5

CO3

- b A sample of 100 measurement of breaking strength of cotton threads gave a mean of 7.5 oz and standard deviation of 1.2 oz. Find a 95% confidence limits for the mean breaking strength of cotton threads.

5

CO3

UNIT-IV

Marks CO BTL

7. a A sample of 400 individuals is found to have a mean height of 67.47 inches. Is it reasonable to regard the sample drawn from the large population with mean height 67.39 inches and standard deviation of 1.3 inches? Test at 1% level of significance.
- b A company claims that its light bulbs are superior to those of its main competitor. If a study showed that $n_1=40$ bulbs has a mean life time of 647 hours with a standard deviation of 27 hours. While a sample from its main competitor of $n_2=40$ bulbs mean lifetime of 638 hours with a standard deviation 31 hours, does this substantiate the claim at 0.05 level of significance.?

5
5 CO4**(OR)**

8. a In a study to investigate whether certain detonators used as explosives in coal mining the requirement is that at least 90% will ignite the explosive when charged is found that 174 of 200 detonators function properly. Test the null hypothesis $p=0.90$ against the alternative hypothesis $p<0.90$ at 0.05 level of significance.
- b In a sample of 600 men from a certain city, 450 men are found to be smokers. In a sample of 900 from another city 450 are found to be smokers. Do the data indicate that the two cities are significantly different with respect to prevalence of smoking habit among men? Test at 1% level of significance.

5
5 CO4**UNIT-V**

Marks CO BTL

9. a Five measurements of tar content of certain kind of cigarette yielded 14.5, 14.2, 14.4, 14.3 and 14.6 milligrams per cigarette. Show that the difference between the mean of this sample and the average tar claimed by the manufacturer $\mu=14.0$ mg/cigarette is significant at $\alpha=0.05$.
- b Two independent random samples of 8 and 7 items respectively have the following values

5
5 CO5

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)

10. 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 and comment

10 CO5

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

UNIT-VI

Marks CO BTL

11. a Find the Karl Pearson's correlation coefficient to the given data:

5 CO6

X	16	21	26	23	28	24	17	22	21
Y	33	38	50	39	52	47	35	43	41

- b Find the Rank correlation coefficient to the given data:

5 CO6

X	68	64	75	50	64	80	75	40	55	64
Y	62	58	68	45	81	60	68	48	50	70

(OR)

12. a In a partially destroyed laboratory record of analysis of correlation data, the following results are only legible.

5 CO6

Variance of $x=9$.

Regression lines are $8x-10y+66=0$

$40x-18y-214=0$.

What were

- i. mean values of x and y ii. correlation coefficient
ii. standard deviation of y .

- b Find the two lines of regression to the following data.

5 CO6

X	7	9	4	10	6	7	8	8	5	6
Y	6	8	6	10	8	5	10	7	7	8

II B.Tech.II Semester Supplementary Examinations, July-2025
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

- | | | Marks | CO | Blooms Level | | | | | | | | | | | | | | | | | | | |
|--|---|----------------|------------------|----------------|------------------|-------|-------|----|----|----|-----|--------------|-----|-----|-----|-----|-------|-----|-----|-----|-----|--|--|
| UNIT-I | | | | | | | | | | | | | | | | | | | | | | | |
| 1. | Show that for the function $f(z) = \begin{cases} \frac{z^5}{ z ^4}, & z \neq 0 \\ 0, & z = 0 \end{cases}$ Cauchy-Rieman equations are satisfied at $z = 0$, but $f(z)$ is not differentiable at 0. | 10 | CO1 | K3 | | | | | | | | | | | | | | | | | | | |
| (OR) | | | | | | | | | | | | | | | | | | | | | | | |
| 2. | In a two-dimensional flow of a fluid, the stream function is $\psi = \frac{-y}{x^2+y^2}$. Compute the velocity potential ϕ . | 10 | CO1 | K3 | | | | | | | | | | | | | | | | | | | |
| UNIT-II | | | | | | | | | | | | | | | | | | | | | | | |
| 3. | Verify Cauchy's theorem for the function $5\sin 2z$ if C is the square with vertices at $1 \pm i$ and $-1 \pm i$. | 10 | CO2 | K4 | | | | | | | | | | | | | | | | | | | |
| (OR) | | | | | | | | | | | | | | | | | | | | | | | |
| 4. | Evaluate $\int_C \frac{z-3}{z^2+2z+5} dz$ where C is the circle (i) $ z+1-i =2$.
(ii) $ z+1+i =2$. | 10 | CO2 | K4 | | | | | | | | | | | | | | | | | | | |
| UNIT-III | | | | | | | | | | | | | | | | | | | | | | | |
| 5. | Calculate the residue of $f(z) = \frac{z^3}{(z-1)^4(z-2)(z-3)}$ at the poles. | 10 | CO3 | K3 | | | | | | | | | | | | | | | | | | | |
| (OR) | | | | | | | | | | | | | | | | | | | | | | | |
| 6. | Show that $\int_0^{2\pi} \frac{d\theta}{\sqrt{2}-\cos\theta} = 2\pi$. | 10 | CO3 | K3 | | | | | | | | | | | | | | | | | | | |
| UNIT-IV | | | | | | | | | | | | | | | | | | | | | | | |
| 7. | Out of 800 families with 5 children each, how many would you expect to have (i) 3 boys (ii) 5 girls (iii) either 2 or 3 boys (iv) at least one boy? Assume equal probabilities for boys and girls. | 10 | CO4 | K2 | | | | | | | | | | | | | | | | | | | |
| (OR) | | | | | | | | | | | | | | | | | | | | | | | |
| 8. | The marks obtained in mathematics by 1000 students is normally distributed with mean 78% and standard deviation 11%. Estimate
(i) How many students got marks above 90%.
(ii) what was the highest mark obtained by the lowest 10% of the students. | 10 | CO4 | K2 | | | | | | | | | | | | | | | | | | | |
| UNIT-V | | | | | | | | | | | | | | | | | | | | | | | |
| 9. | Construct S.D. of means for the population 3, 7, 11, 15 by drawing samples of size two with replacement. Determine (a) μ (b) σ (c) S.D.M. (d) $\mu_{\bar{x}}$ (e) $\sigma_{\bar{x}}$. | 10 | CO5 | K3 | | | | | | | | | | | | | | | | | | | |
| (OR) | | | | | | | | | | | | | | | | | | | | | | | |
| 10. | Assuming that the population standard deviation is 0.3, calculate the (a) 95% and (b) 99% confidence intervals for the mean lead concentration in a river if the mean lead concentration recovered from a sample of lead measurements in 36 different locations is 2.6 gms/ml. | 10 | CO5 | K3 | | | | | | | | | | | | | | | | | | | |
| UNIT-VI | | | | | | | | | | | | | | | | | | | | | | | |
| 11. | A company claims that the mean thermal efficiency of diesel engines produced by them is 32.3%. To test this claim, a random sample of 40 engines were examined which showed the mean thermal efficiency of 31.4% and s.d of 1.6%. Can the claim be accepted or not, at 0.01 L.O.S.? | 10 | CO6 | K4 | | | | | | | | | | | | | | | | | | | |
| (OR) | | | | | | | | | | | | | | | | | | | | | | | |
| 12. | A study was conducted to estimate the proportion of wives who regularly watch TV 'serials' yielding the following data: | 10 | CO6 | K4 | | | | | | | | | | | | | | | | | | | |
| | <table border="1"> <thead> <tr> <th></th> <th>PG wives</th> <th>Graduate wives</th> <th>Illiterate wives</th> <th>Total</th> </tr> </thead> <tbody> <tr> <td>Watch</td> <td>52</td> <td>31</td> <td>37</td> <td>120</td> </tr> <tr> <td>Do not watch</td> <td>148</td> <td>119</td> <td>113</td> <td>380</td> </tr> <tr> <td>Total</td> <td>200</td> <td>150</td> <td>150</td> <td>500</td> </tr> </tbody> </table> | | PG wives | Graduate wives | Illiterate wives | Total | Watch | 52 | 31 | 37 | 120 | Do not watch | 148 | 119 | 113 | 380 | Total | 200 | 150 | 150 | 500 | | |
| | PG wives | Graduate wives | Illiterate wives | Total | | | | | | | | | | | | | | | | | | | |
| Watch | 52 | 31 | 37 | 120 | | | | | | | | | | | | | | | | | | | |
| Do not watch | 148 | 119 | 113 | 380 | | | | | | | | | | | | | | | | | | | |
| Total | 200 | 150 | 150 | 500 | | | | | | | | | | | | | | | | | | | |
| Is there reason to believe at 0.05 L.O.S. that there is no difference among the true proportions of wives with different educational back ground who watch TV 'serials'. | | | | | | | | | | | | | | | | | | | | | | | |

AR18

CODE: 18ECT207

SET-2

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)**

II B.Tech II Semester Supplementary Examinations, July, 2025

**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) Explain about different types of charge distributions. 6M
b) Explain the electric field intensity due to circular ring 6M
- (OR)
2. a) Derive the Expression for electric potential due to finite line charge? 6M
b) Define electric flux density and derive the equations of Gauss law in differential form 6M

UNIT-II

3. a) State and Explain about Biot-Savart's law with different current sources 6M
b) Explain H field due to line charge using Ampere's law. 6M
- (OR)
4. a) Derive the equation of Force on moving charge due to electric and magnetic fields 6M
b) Explain about current elements in magnetic field. 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 Explain the significance of transformer e.m.f. 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 displacement current density 4M

UNIT-IV

7. a) Derive the expression for an EM wave incident obliquely on a dielectric with parallel polarization 6M
b) Define Uniform plane waves and obtain the relation between E&H. 6M
- (OR)
8. a) Explain the wave Propagation in Lossless and Conducting Media. 6M
b) Explain the linear polarization, circular polarization and elliptical polarization 6M

UNIT-V

9. a) Derive a relation between reflection coefficient and characteristic impedance 6M
b) Explain the condition of a loss less line 6M
- (OR)
10. a) Explain short circuited and open circuited transmission lines 6M
b) Discuss the stub matching techniques of impedance matching. 6M

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

- Find the value of a.
- Evaluate $P(X < 3)$, $P(X \geq 3)$, $P(2 \leq X < 5)$
- 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

- exactly two will be defective
- at least two will be defective
- 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 for a car on each day is distributed as a Poisson distribution with mean 1.5. Calculate

6M

- the proportion of days on which neither car is used.
- 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 probability function
- $f(x)=6x(1-x)$
- ;
- $0 \leq x \leq 1$
- .

6M

- check whether $f(x)$ is a probability density function
- 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 with standard deviation=3 hours. Assuming the data to be normally distributed, what percentage of battery cells are expected to have life

6M

- more than 15 hours
- less than 6 hours
- between 10 and 14 hours

(OR)

4. a) If the probability density function of a random variable is given
- $f(x)=k(1-x^2)$
- ,
- $0 \leq x \leq 1$
- . Find

6M

- the value of k
- mean
- variance

- b) In a referendum 60% of voters voted in favour. A random sample of 200 voters was selected. What is the probability that in the sample

6M

- more than 130 voted in favour
- 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

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 Explain coulomb's law. **6M**
b) Explain about electric field intensity due to a charge. **8M**
- (OR)**
2. a) Derive Poisson's and Laplace equations from fundamentals. **8M**
b) Explain about capacitance in parallel plates. **6M**

UNIT-II

3. a) State Ampere's circuital law. Specify the conditions to be met for determining magnetic field strength **H** based on Ampere's circuital law. **6M**
b) Explain about force due to current element. **8M**
- (OR)**
4. a) State and explain the Biot-Savart's law relating magnetic field produced at a point due to the current in a small elemental wire. **8M**
b) Explain about current elements. **6M**

UNIT-III

5. a) State the Faraday's laws of electromagnetic induction and derive the expressions for the transformer and motional e.m.f.s. **8M**
b) Explain the concept of displacement current and obtain an expression for the displacement current density. **6M**
- (OR)**
6. a) Write the Maxwell's equations in point and integral form for time varying fields? **8M**
b) Derive the boundary conditions between media having dielectric and conductor. **6M**

UNIT-IV

7. a) Discuss about reflection and refraction of plane waves for normal incidence at the interface between two dielectrics. **8M**
b) Derive the wave equation in **E** and **H** for free space conditions. **6M**

(OR)

8. a) State and prove Poynting theorem. Explain its significance **8M**
b) Explain about free space Characteristics. **6M**

UNIT-V

9. a) Explain about (i) Voltage reflection coefficient (ii) VSWR **8M**
(iii) Position of V_{\max} , I_{\max} , V_{\min} and I_{\min} .
b) Write the applications of smith chart. **6M**

(OR)

10. a) Explain about characteristic Impedance and propagation constant. **8M**
b) Discuss about Single and Double stub matching. **6M**

AR16

CODE: 16CS2007

SET-1

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)**

II B.Tech II Semester Supplementary Examinations, July, 2025

**Formal Languages and Automata Theory
(COMMON TO CSE & IT Branches)**

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) What are the differences between DFA and NFA? 7M
- b) Given an NFA transition table, convert from the NFA to DFA. 7M

Transition Table:

	a	b	c
$\rightarrow p$	\emptyset	$\{q\}$	$\{r\}$
q	$\{p\}$	$\{r\}$	$\{p, q\}$
* r	\emptyset	\emptyset	\emptyset

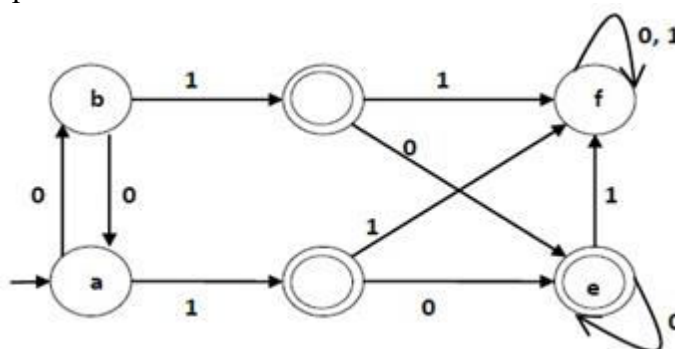
(OR)

2. a) Define the closure properties of NFA. 7M
- b) Conversion from Mealy to Moore Machine for the following table. 7M

	Input=0		Input=1	
Present State	Next State	Output	Next State	Output
q0	q1	0	q2	0
q1	q1	0	q2	1
q2	q1	1	q2	0

UNIT-II

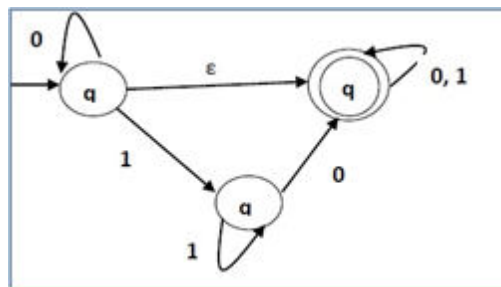
3. a) Explain the Identities Related to Regular Expressions. 7M
- b) State and explain DFA Minimization using Myhill-Nerode Theorem with the following example. 7M



(OR)

1 of 2

4. a) Explain regular grammar and give one example. **4M**
 b) Convert the following NFA- ϵ to NFA without Null move. **10M**



UNIT-III

5. a) Define context-free grammar. Explain with example. **7M**
 b) Let a CFG $\{N, T, P, S\}$ be $N = \{S\}$, $T = \{a, b\}$, Starting symbol = S , $P = S \rightarrow SS \mid aSb \mid \epsilon$. Define Leftmost derivation from the above CFG is “abaabb” **7M**
- (OR)**
6. a) Find out whether the language $L = \{x^n y^n z^n \mid n \geq 1\}$ is context free or not. Using Pumping lemma theorem. **7M**
 b) Convert the following CFG into CNF **7M**
 $S \rightarrow XY \mid Xn \mid p \quad X \rightarrow mX \mid m \quad Y \rightarrow Xn \mid o$

UNIT-IV

7. a) Define a PDA and Explain the model of PDA. **6M**
 b) Construct a PDA that accepts $L = \{0^n 1^n \mid n \geq 0\}$ **8M**
- (OR)**
8. a) Consider the following PDA which accepts L by empty stack and convert it into equivalent PDA which accepts L by final state. **7M**
 $M = (\{q_0, q_1\}, \{a, b\}, \{B, z_0\}, \delta, q_0, z_0, \Phi)$ where δ is given by
 $\delta(q_0, a, z_0) = (q_0, Bz_0)$
 $\delta(q_0, a, B) = (q_0, BB)$
 $\delta(q_0, b, B) = (q_1, \epsilon)$
 $\delta(q_1, b, B) = (q_1, \epsilon)$
 $\delta(q_1, \epsilon, z_0) = (q_1, \epsilon)$
 the above PDA accepts $L = \{a^n b^n \mid n \geq 1\}$ by empty stack
 b) Consider a PDA $M = (\{s, p, q\}, \{a, c\}, \{a, z_0\}, \delta, s, z_0, p)$ which accepts language $L = \{a^n cb^n \mid n \geq 1\}$ by final state, where δ is defined as follows **7M**
 $\delta(s, a, z_0) = (s, az_0)$
 $\delta(s, a, a) = (s, aa)$
 $\delta(s, c, a) = (q, a)$
 $\delta(q, a, a) = (q, \epsilon)$
 $\delta(q, \epsilon, z_0) = (p, z_0)$
 Construct an equivalent PDA M^1 which accepts L in empty stack

UNIT-V

9. a) Define a Turing machine and Explain the model of the Turing machine. **4M**
 b) Design a Turing Machine for $L = \{a^n, b^n, c^n \mid n \geq 1\}$. **10M**
- (OR)**
10. a) What is Universal Turing Machine? Explain it. **7M**
 b) Explain the linear bounded Turing machine. **7M**