

II B.Tech II Semester Supplementary Examinations, September-2022
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

<u>UNIT-I</u>		Marks	CO	Blooms Level
1.	Test whether the function $f(z) = \begin{cases} \frac{xy^2(x+iy)}{x^2+y^4}, & z \neq 0 \\ 0, & \text{if } z = 0 \end{cases}$ is analytic or not at $z = 0$.	10M	CO1	Analyze K4
(OR)				
2.	Build the most general analytic function whose real part is $u = x^2 - y^2 - x$.	10M	CO1	Apply K3
<u>UNIT-II</u>		Marks	CO	Blooms Level
3.	Verify Cauchy's theorem for the function $f(z) = z^2 + 3z - i2$ if C is the circle $ z = 1$.	10M	CO2	Evaluate K5
(OR)				
4.	Evaluate $\int_C \frac{\sin^6 z}{(z - \frac{\pi}{2})^3} dz$ where C is $ z = 1$ using Cauchy's integral formula.	10M	CO2	Evaluate K5
<u>UNIT-III</u>		Marks	CO	Blooms Level
5.	Calculate the residues of $\frac{z^2}{1-z^4}$ at those poles which lie inside the circle $ z = 1.5$.	10M	CO3	Apply K3
(OR)				
6.	Calculate $\int_C \frac{\sin z}{z^6} dz$ where $C: z = 2$ by Residue theorem.	10M	CO3	Apply K3
<u>UNIT-IV</u>		Marks	CO	Blooms Level
7.	20% of the items produced from a factory are defective. Find the probability that in a sample of 5 chosen at random (i) none is defective (ii) one is defective (iii) $p(1 < x < 4)$.	10M	CO4	Understand K2
(OR)				
8.	Suppose the weights of 800 male students are normally distributed with mean $\mu = 140$ pounds and standard deviation 10 pounds. Find the number of students whose weights are (i) between 138 and 148 pounds (ii) more than 152 pounds.	10M	CO4	Understand K2
<u>UNIT-V</u>		Marks	CO	Blooms Level
9.	A population consists of four numbers 2, 3, 4, 5. Consider all possible distinct samples of size two with replacement. Find (a) the population mean (b) the population standard deviation (s.d.) (c) the sampling distribution of means (d) the mean of the S.D. of means	10M	CO5	Understand K2

(OR)

10. A random sample of 400 items is found to have mean 82 and S.D. of 18. Find the maximum error of estimation at 95% confidence interval. Find the confidence limits for the mean if $\bar{x} = 82$. 10M CO5 Understand K2

UNIT-VI

11. A random sample of 40 'geyers' produced by company A have a mean lifetime (*mlt*) of 647 hours of continuous use with a *s.d.* of 27 hours, while a sample 40 produced by another company B have *mlt* of 638 hours with *s.d.* 31 hours. Does this substantiate the claim of company A that their 'geyers' are superior to those produced by company B at 0.05 Level of Significance. 10M CO6 Analyze K4

(OR)

12. A study was conducted to determine whether physical handicappers (P.H.) affects the performance of worker's in an industry with the following results: 10M CO6 Analyze K4

	Performance			Total
	Good	Satisfactory	Not Satisfactory	
Blind	21	64	17	102
Deaf	16	49	14	79
No Handicap	29	93	28	150
Total	66	206	59	331

Test the claim that handicaps have no effect on performance at 0.05 Level of Significance. Using Chi-square test

Time: 3 Hours

Max Marks: 60

Answer ONE Question from each Unit

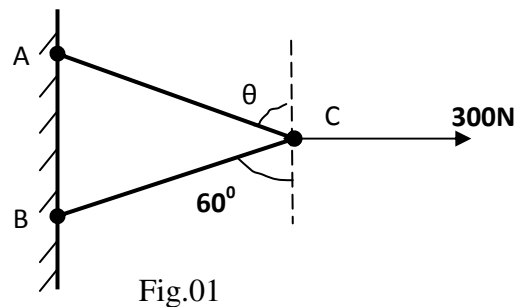
All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-I

1. a) State and prove the Lame's theorem
 b) A 300N force is applied at C as shown in Fig.01. Determine
 (i) The value of angle θ for which the larger of the cable tension is as small as possible.
 (ii) The corresponding values of tension in the cable AC and BC.

Marks	CO	Blooms Level
4M	1	L4

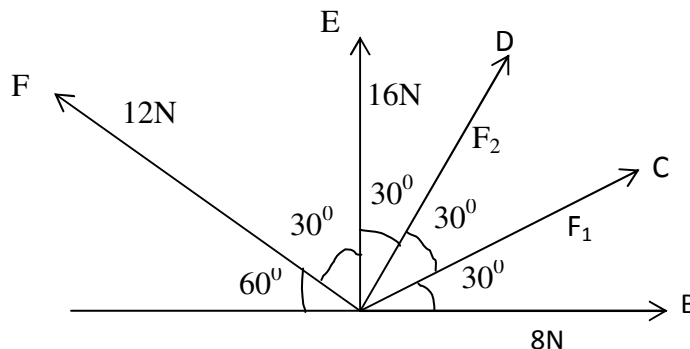


6M	1	L3
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(OR)

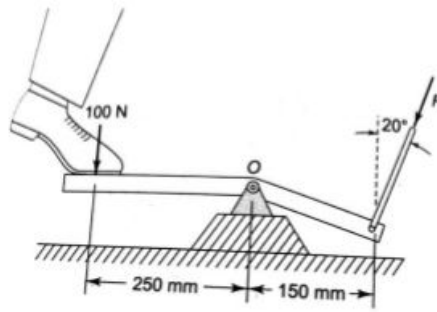
2. a) State the Parallelogram law and Transmissibility of the force
 b) Determine the magnitude of F_1 and F_2 for the following system of forces which are in equilibrium.

4M	1	L4
6M	1	L3

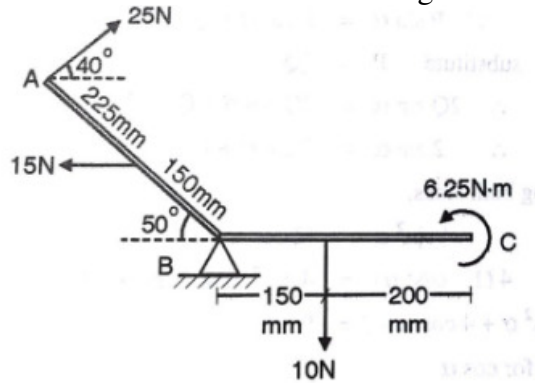
UNIT-II

3. a) A 100 N force is required to operate the foot pedal as shown in fig. Determine the force (F) exerted by the lever on the bearing at O. Neglect the weight of the lever.

Marks	CO	Blooms Level
4M	2	L3



- b) Determine and locate the resultant R of the forces and couple acting on the beam as shown in diagram 6M 2 L3



(OR)

4. A roller of radius 40 cm of weight 3000 N is to be pulled over a rectangular block of height 20 cm as shown in Fig. By a force P applied horizontally at the centre of roller. What would be the magnitude of this force? Also determine the least force and its line of action at the centre of the roller for turning the roller over the rectangular block. 10M 2 L4

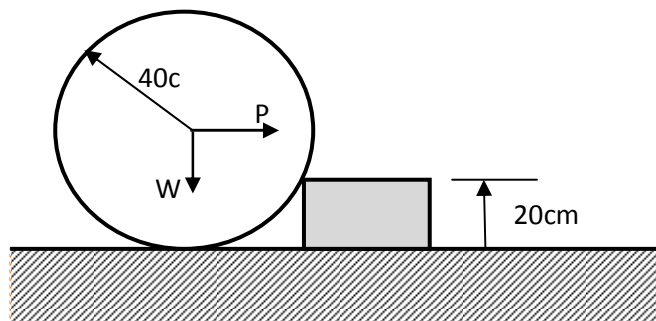
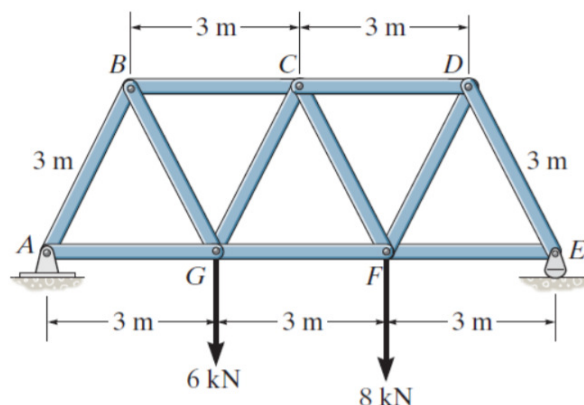


Fig.

UNIT-III

5. Determine the force in members BC, CG, and GF of the Warren truss. Indicate if the members are in tension or compression. 10M 3 L3



(OR)

6. A block of weight 150 N is resting on another block B of weight 250 N and tied to the wall by a rope as shown in Fig. 05. The block B is resting on horizontal floor. The static friction between blocks A and B is 0.2 and between block B and floor is 0.25. A force P whose inclination with horizontal is 30° , is applied to block B such that motion impends. Find the magnitude of forces P and tension in the rope.

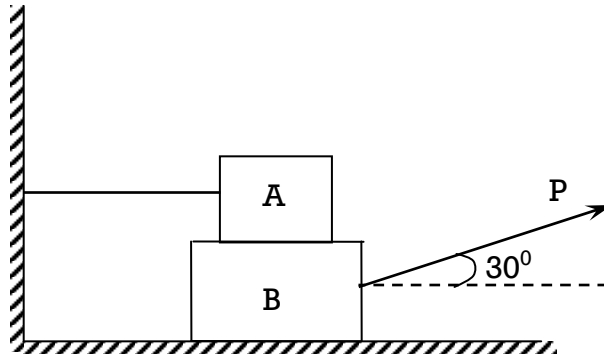
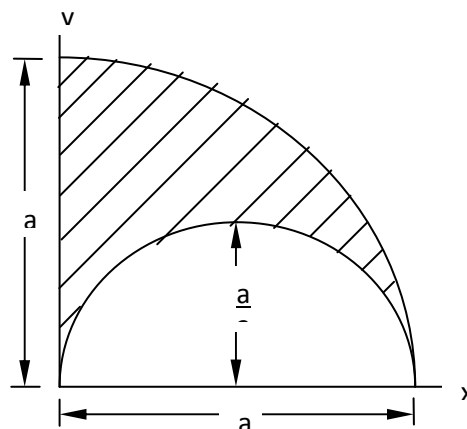


Fig.05

UNIT-IV

7. a) From the basic principle derive the Centroid of a triangle whose base width is 'b' and altitude height 'h'.
b) Locate the centroid C of the shaded area obtained by cutting a semi circle of diameter 'a' from the quadrant of a circle of radius 'a' as shown in figure.



(OR)

8. From a rectangular cross section, 80 mm wide and 100 mm high, two semi-circular portions of each 60 mm dia. are removed as shown in Fig.06. Determine I_{xx} and I_{yy} for the cross section.

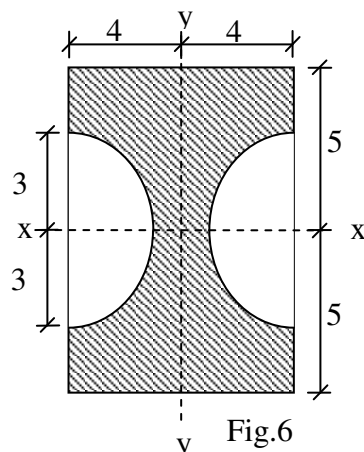
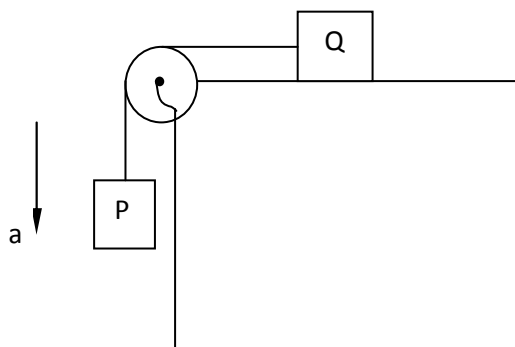


Fig.6

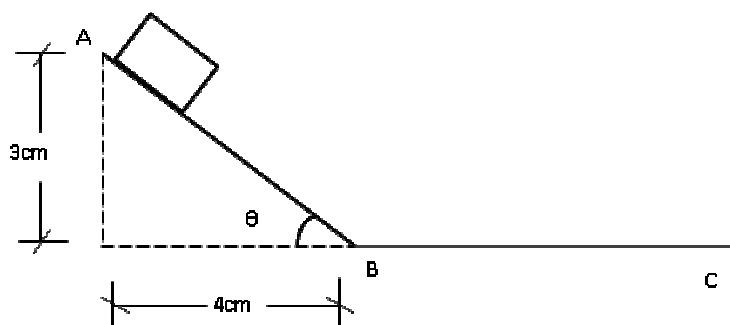
<u>UNIT-V</u>		Marks	CO	Blooms Level
9.	a) A motorist travelling at a speed of 70kmph suddenly applies brakes and halts after skidding 50m. Determine: i) The time required to stop the car. ii) The coefficient of friction between the tires and the road.	4M	5	L3
	b) A particle moves along a straight line with a velocity given by the equation. Where v is the velocity in m/s and t is the time in seconds. When $t = 2$ seconds, the particle is to be at a distance of 10m from a station A. Determine the acceleration and displacement of the particle after 6 seconds.	6M	5	L3
(OR)				

10. A flywheel which accelerates at uniform velocity is observed to have made 100 revolutions to increase its velocity from 120 rpm to 160 rpm. if the flywheel originally at rest determine
- Acceleration
 - Time taken to increase the velocity from 120rpm to 160 rpm
 - Revolution made in reaching a velocity of 160 rpm, starting from rest.

<u>UNIT-VI</u>		Marks	CO	Blooms Level
11.	Referring to the fig, find the acceleration of a falling weight P, if the coefficient of friction between the block Q and the horizontal plane on which it slides is μ . Neglect the inertia of the pulley and friction. Assume $P=10\text{kg}$, $Q=12\text{kg}$ and $\mu=1/3$.	10M	6	L3



- (OR)**
12. A small block starts from rest at A and slides down the inclined plane as shown in figure. What distance along horizontal plane will it travel before coming to rest? The coefficient of kinematic friction between block and either plane is 0.3. Assume that the initial velocity with which it starts to move along BC is of the same magnitude as that gained in sliding from A to B.



**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. | Explain the working principle of the Rankine cycle and derive an expression for its efficiency with P-v, T-s, and h-s plots. | 10M | 1 | Understanding |
| | (OR) | | | |
| 2. | Steam is supplied to a turbine at 30 bar and 350°C. The turbine exhaust pressure is 0.08 bar. The main condensate is heated regeneratively in two stages by steam bled from the turbine at 5 bar and 1 bar respectively. Calculate masses of steam bled off at each pressure per kg of steam entering the turbine and the theoretical thermal efficiency of the cycle. | 10M | 1 | Applying |
| | (OR) | | | |
| | <u>UNIT-II</u> | Marks | CO | Blooms Level |
| 3. | Classify water tube boilers & explain the working of Babcock and Wilcox boiler with specifications and neat labelled sketch? | 10M | 2 | Understanding |
| | (OR) | | | |
| 4. | Explain the functions of the following devices?
a. Fusible Plug
b. Blow off Cock valve
c. Economizer
d. Superheater
e. Safety Valve | 10M | 2 | Understanding |
| | (OR) | | | |
| | <u>UNIT-III</u> | Marks | CO | Blooms Level |
| 5. a | Explain the types of steam nozzles. Where are they used? | 5M | 3 | Remembering |
| b | In a steam nozzle, the steam expands from 4 bar to 1 bar. The initial velocity is 60 m/s and the initial temperature is 200°C. Determine the exit velocity if the nozzle efficiency is 92%. | 5M | 3 | Applying |
| | (OR) | | | |
| 6. | Classify Surface Condensers. Explain briefly the working of any two types of surface condensers with neat sketches. | 10M | 3 | Understanding |
| | (OR) | | | |
| | <u>UNIT-IV</u> | Marks | CO | Blooms Level |
| 7. a | In a De Laval turbine steam issues from the nozzle with a velocity of 1200 m/s. the nozzle angle is 20°, the mean blade velocity is 400 m/s, and the inlet and outlet angles of blades are equal. The mass of steam flowing through the turbine per hour is 1000 kg. Calculate: (i) Blade angles (ii) power developed and (iii) blade efficiency. | 5M | 4 | Applying |
| b | What is the need of compounding impulse turbines? Explain any one method in detail. | 5M | 4 | Understanding |
| | (OR) | | | |
| 8. a | Differentiate between impulse turbine and Reaction turbine | 5M | 4 | Remembering |
| b | Prove that degree of reaction of a parson's turbine is 50% | 5M | 4 | Applying |

UNIT-V		Marks	CO	Blooms Level
9.	The air enters the compressor of an open cycle constant pressure gas turbine at a pressure of 1bar and a temperature of 20 ⁰ C. The pressure of the air after compression is 4 bar. The isentropic efficiencies of compressor and turbine are 80% and 85% respectively. The air-fuel ratio used is 90:1. If the flow rate of air is 3kg/s, find (i) Power developed (ii) Thermal efficiency of the cycle. Assume $C_p = 1.0 \text{ kJ/kg K}$ and $\gamma = 1.4$ for air and gases. The calorific value of fuel is 41800kJ/kg	10M	5	Applying
(OR)				
10. a	List the advantages of closed-cycle gas turbine over open cycle gas turbine	5M	5	Remembering
b	Derive the thermal efficiency of the ideal Brayton cycle with T-s and P-v Plot.	5M	5	Analyzing
UNIT-VI		Marks	CO	Blooms Level
11.	The atmospheric air at 30 ⁰ C DBT and 75% RH enters a cooling coil at the rate of 200m ³ /min. The coil dew point temperature is 14 ⁰ C and the BPF of the coil is 0.1. Determine (i) The temperature of the air leaving the cooling coil. (ii) The capacity of the cooling coil in TR and in KW. (iii) Amount of water vapour removed per minute. (iv) The sensible heat factor for the process.	10M	6	Applying
(OR)				
12. a	What is the significance of BPF and derive its expression?	5M	6	Applying
b	Explain the following terms: (i) RSHF (ii) GSHF (iii) ESHF	5M	6	Remembering

NETWORK ANALYSIS
(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. Compute the value of I_2 and power dissipated by 12Ω resistor using Mesh analysis for the circuit shown in Fig-1.

Marks	CO	Blooms Level
10	1	3

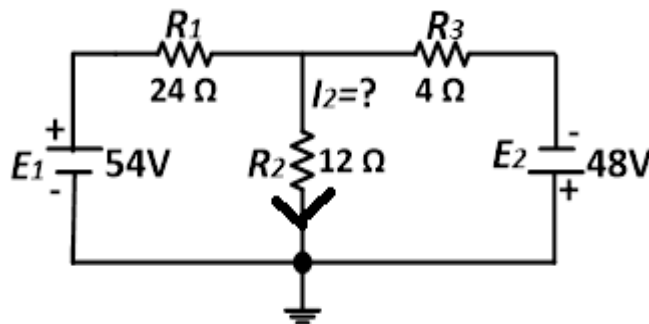


Fig-1

(OR)

2. Compute the voltage V in the circuit shown in fig-2 by using Nodal Analysis.

Marks	CO	Blooms Level
10	1	3

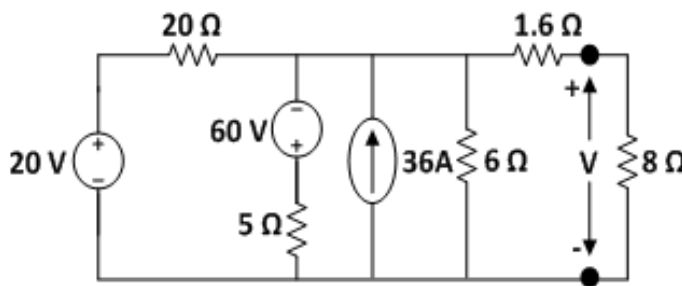


Fig-2

UNIT-II

3. State and explain maximum power transfer theorem with an example.

Marks	CO	Blooms Level
10	2	2

(OR)

4. a Verify the Tellegen's theorem for the given circuit shown in Fig-4.

Marks	CO	Blooms Level
5	2	2

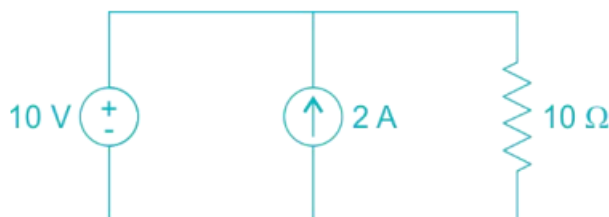


Fig-4

- b Using Millman's theorem find current through R_L for the circuit shown in Fig-5. 5 2 2

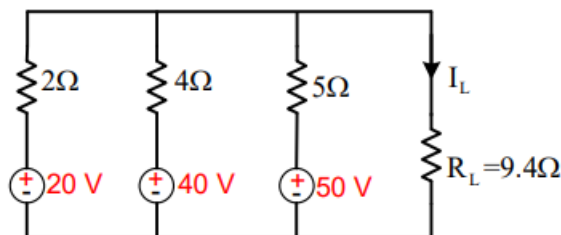


Fig-5

UNIT-III

5. Compute the Transmission parameters for the cascaded networks shown in Fig-6. 10 3 3

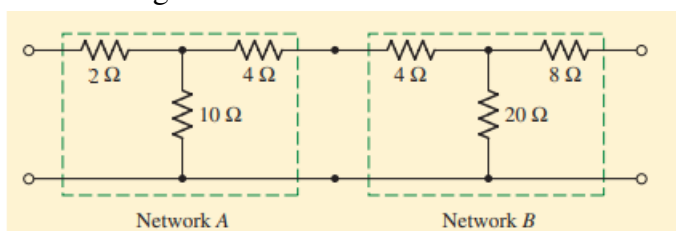


Fig-6

(OR)

6. Obtain both open circuit and short circuit parameters for the two-port network shown in below fig-7. 10 3 2

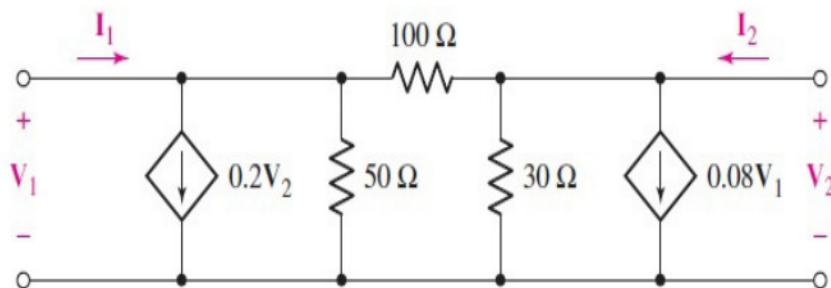


Fig-7

UNIT-IV

7. a A parallel RLC circuit has the following parameters: $R = 6 \text{ k}\Omega$, $\text{BW} = 1000 \text{ rad/sec}$ and $Q = 120$. Compute the values of L and C and resonating frequency. 6 4 2
- b Draw and explain the current locus of a series RL circuit with variable resistor. 4 4 1

(OR)

8. Compute the value of 'L' for which the circuit shown in fig-8 is resonant at a frequency of $\omega_0 = 100$ rad/sec. 10 4 2

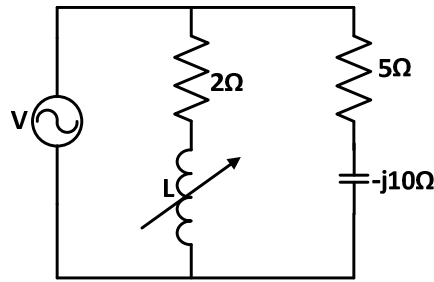


Fig-8

UNIT-V

9. A low-pass filter is composed of a symmetrical Π (pi)-section. Each series branch is a 0.02H inductor and shunt branch is a 2 μ F capacitor. Find (a) cut-off frequency (b) nominal impedance (c) characteristic impedance at 200Hz and 2000Hz (d) attenuation at 200Hz and 2000Hz and (e) phase shift constant at 200Hz and 2000Hz.

Marks CO Blooms Level

10 5 2

(OR)

10. Design a composite low-pass filter to have a cut-off frequency of 1000Hz and a characteristic impedance of 600 Ω . Use one constant-k T section, one m-derived T section and two terminating half sections with $m=0.6$. The frequency of infinite attenuation is 1050Hz.

Marks CO Blooms Level

10 6 3

UNIT-VI

11. For the circuit shown in Fig-9, the switch is closed at $t=0$. Compute the current 'i' and voltage across each element, if $V_s=50$ V, $R=4\Omega$, $L=1$ H and $C=\frac{1}{4}$ F.

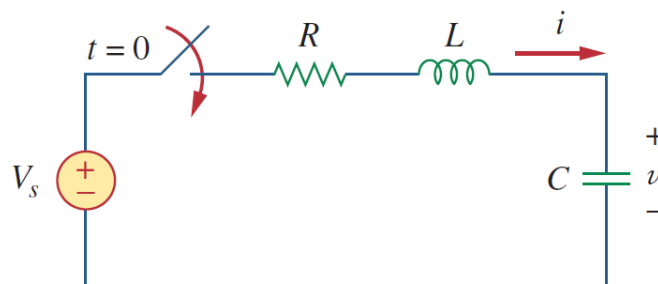


Fig-9

(OR)

12. Compute the voltage across the capacitor for the network shown in Fig-10 when the switch is closed at $t=0$. Consider $v(t)=10\sin 5t$.

10 6 3

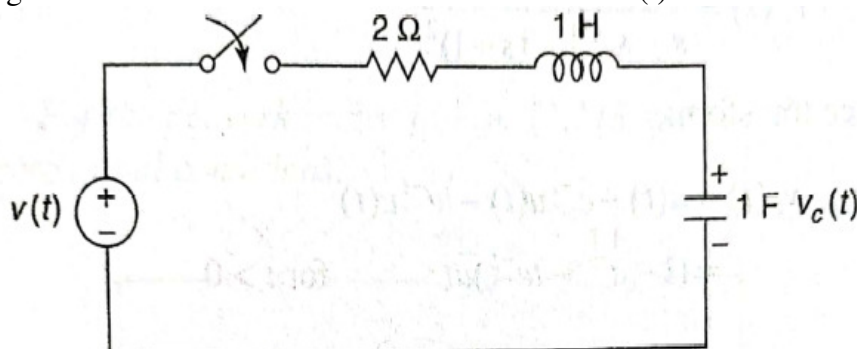


Fig-10

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

<u>UNIT-I</u>			Marks	CO	Blooms Level
1.	a	Two dice are thrown. Let X assign to each point (a, b) in S the maximum of its numbers $X(a,b) = \max.(a,b)$. Obtain the probability distribution, X is a random variable with $X(s) = \{1, 2, 3, 4, 5, 6\}$. Also find the mean and variance of the distribution.	5	CO1	
	b	Let X be a Poisson random variable such that $2 P(X = 0) = 4P(X = 1) + 5 P(X = 2)$ Find its Mean and variance	5	CO1	
		(OR)			
2.		Determine mean and variance of binomial distribution	10	CO1	

UNIT-II

<u>UNIT-II</u>		Marks	CO	Blooms Level
3	Let X be a random variable with PDF $f(x) = \frac{1}{2}, 0 < x < 1$ Find mean and variance of x.	10	CO2	
(OR)				
4	The marks obtained in mathematics by 1000 students are normally distributed with mean 78% and standard deviation 11%. Determine the probability of students got marks above 90%.	10	CO2	

UNIT-III

		<u>UNIT-III</u>	Marks	CO	Blooms Level
5.		A population consists of five numbers 2, 3, 6, 8 and 11. Consider all possible samples of size 2 that can be drawn without replacement from the population. Obtain (a) The mean of the population. (b) The standard deviation of the population. (c) The mean of the sampling distribution of means and (d) The standard deviation of sampling distribution of means	10	CO3	
(OR)					
6.	a	The mean height of students in a college is 155cms and standard deviation is 15cms. What is the probability that the mean height of 36 students is less than 157cms?	5	CO3	
	b	The efficiency expert of a computer company tested 40 engineers to estimate the average time it takes to assemble a certain computer component getting a mean of 12.73 minutes and S.D of 2.06 minutes. (i) If $\bar{x}= 12.73$ is used as a point estimate of the actual average time required to perform the task, determine the maximum error with 99% confidence. (ii) Construct 98% confidence intervals for the true average time it takes to do the job.	5	CO3	

UNIT-IV

- | | | Marks | CO | Blooms Level |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-----|--------------|
| 7. | a Explain about the One-tailed and Two-tailed tests of testing of hypothesis | 5 | CO4 | |
| | b A manufacture claimed that at least 95% of the equipment which he supplied to a factory conformed to specifications. An examination of a sample 200 pieces of equipment revealed that 18 were faulty. Test his claim at 5% level of significance. | 5 | CO4 | |
| (OR) | | | | |
| 8. | a An ambulance service claims that it takes on the average less than 10 minutes to reach its destination in emergency calls. A sample of 36 calls has a mean of 11 minutes and the variance of 16 minutes. Test the claim at 0.05 level of significance. | 5 | CO4 | |
| | b The average hourly wage of a sample of 150 workers in a plant A was Rs.2.56 with a standard deviation of Rs.1.08. The average hourly wage of a sample of 200 workers in plant B was Rs.2.87 with a standard deviation of Rs.1.28. Can an applicant safely assume that the hourly wages paid by plant B are higher than those paid by plant A? | 5 | CO4 | |

UNIT-V

- | | | Marks | CO | Blooms Level |
|----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-----|--------------|
| 9. | An insurance agent has claimed that the average age of policyholders who insure through him is less than the average for all agents which is 30.5 years. A random sample of 100 policyholders who had insured through him gave the following age distribution. Calculate the arithmetic mean and standard deviation of this distribution and use these values to test his claim at the 5% level of significance. | 10 | CO5 | |

Age last birthday	16-20	21-25	26-30	31-35	36-40
No.of persons	12	22	20	30	16

- (OR)**
- | | | | |
|-----|-----------------------------------------------------------------------------------------------------------------------------------|----|-----|
| 10. | Three different machines are used for a production. On the basis of the outputs, test whether the machines are equally effective. | 10 | CO5 |
|-----|-----------------------------------------------------------------------------------------------------------------------------------|----|-----|

Machine I	10	5	11	10
Machine II	9	7	5	6
Machine III	20	16	10	4

UNIT-VI

- | | | Marks | CO | Blooms Level |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-----|--------------|
| 11 | Marks of 11 students in two subjects A and B are given below. Obtain the rank correlation coefficient of them. | 10 | CO6 | |
| | <div style="display: flex; justify-content: space-between;"> <div style="width: 15%;"> Marks in subject
A </div> <div style="width: 85%;"> 25 36 20 36 48 52 25 65 35 45 60 </div> </div> <div style="display: flex; justify-content: space-between;"> <div style="width: 15%;"> Marks in subject
B </div> <div style="width: 85%;"> 35 42 30 42 56 68 45 50 42 55 68 </div> </div> | | | |
| (OR) | | | | |
| 12 | The following data related to the age of husbands and wives. Obtain the regression equations and determine the most likely age of husbands for age of wife 25 years and most likely age of wife for age of husbands 30 years. | 10 | CO6 | |

Age of husband	25	28	30	32	35	36	38	39	42	45
Age of wife	20	26	29	30	25	18	26	35	35	46

AR18

CODE: 18BST204

SET-2

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

II B.Tech II Semester Supplementary Examinations, September, 2022

**COMPLEX VARIABLES AND STATISTICAL METHODS
(Civil Engineering)**

Time: 3 Hours

Max Marks: 60

Answer ONE Question from each Unit

All Questions Carry Equal Marks

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UNIT-I

1. a) Show that $f(z) = z + 2\bar{z}$ is not analytic anywhere in the complex plane. 6M
b) If $f(z)$ is an analytic function of z , then prove that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right) \log |f(z)| = 0$ 6M

(OR)

2. a) Find the conjugate harmonic of $u(r, \theta) = r^2 \cos 2\theta - r \cos \theta + 2$. Also show that u is harmonic. 6M
b) Find the regular function whose imaginary part is $e^x \sin y$. 6M

UNIT-II

3. a) Evaluate $\int_C \frac{\sin^2 z}{(z - \pi/6)^3} dz$ where C is the circle $|z| = 1$. Using Cauchy's integral formula. 6M
b) If $f(\xi) = \int_C \frac{4z^2 + z + 5}{z - \xi} dz$ and C is the ellipse $(x/2)^2 + (y/3)^2 = 1$. Find the values of (i) $f(3.5)$ (ii) $f(i)$, $f'(-1)$ and $f''(-i)$. 6M

(OR)

4. a) Construct Laurent's series about $z = 1$ for $f(z) = \frac{e^z}{(z-1)^2}$ 6M
b) Determine the poles of the function $f(z) = \frac{z^2}{(z-1)^2(z+2)}$ and the residue at each pole 6M

UNIT-III

5. a) If a bank receives on the average $\alpha = 6$ bad cheques per day, what are the probabilities that it will receive a) 4 bad cheques in any given day? b) 10 bad cheques over any 2 consecutive days. 6M
b) In a test of 2000 electric bulbs, it was found that the life of a particular type was normally distributed with an average life of 2040 hours and S.D. of 60 hours. Estimate the number of bulbs like to burn for (a) more than 2150 hours (b) less than 1950 hours (c) more than 1920 and less than 2160 hours. 6M

(OR)

6. A survey of 320 families with 5 children each revealed the following distribution. 12M

Number of boys	5	4	3	2	1	0
Number of girls	0	1	2	3	4	5
Number of families	14	56	110	88	40	12

Is the result consistent with that male and female births are equally probable?

UNIT-IV

7. a) In 64 randomly selected hours of production, the mean and standard deviation of the number of acceptable pieces produced by automatic stamping machine are $\bar{X} = 1038$, $s = 146$. At 0.05 level of significance does this enable us to reject the null hypothesis $\mu = 1000$ against the alternative hypothesis $\mu > 1000$. 6M
- b) A random sample of 1000 men from North India shows that their mean wage is Rs. 5 per day with a S.D. of Rs. 1.50. A sample of 1500 men from South India gives a mean wage of Rs. 4.50 per day with a S.D. of Rs. 2. Does the mean rate of wages vary as between two regions? 6M

(OR)

8. a) A sample of 900 members is found to have mean of 3.4 cm. Can it reasonably be regarded as a truly random sample from a large population with mean 3.25 cm and standard deviation 1.61 cm. 6M
- b) A certain cubical die was thrown 9000 times and 5 or 6 were obtained 3240 times. On the assumption of a fair throwing does the data indicate the die is unbiased? 6M

UNIT-V

9. a) A chemical company wishing to study the effect of extraction time on the efficiency of an extraction operation obtained the data shown in the following table: 6M

Extraction time x	27	45	41	19	35	39	19	49	15	31
Extraction efficiency (%) y	57	64	80	46	62	72	52	77	57	68

Fit a straight line to the given data and use it to predict the extraction efficiency one can expect when the extraction time is 35 minutes.

- b) For the data given below, find an equation to the best fitting curve of the form $y = ab^x$ 6M

x:	1	2	3	4	5	6	7	8
y:	1	1.2	1.8	2.5	3.6	4.7	6.6	9.1

(OR)

10. For the following data, find the correlation coefficient and the regression lines. 12M

x:	21	23	30	54	57	58	72	78	87	90
y:	60	71	72	83	110	84	100	92	113	135

AR18

CODE: 18EST103

SET-2

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

II B.Tech II Semester Supplementary Examinations, September, 2022

**ENGINEERING MECHANICS
(Electrical & Electronics Engineering)**

Time: 3 Hours

Max Marks: 60

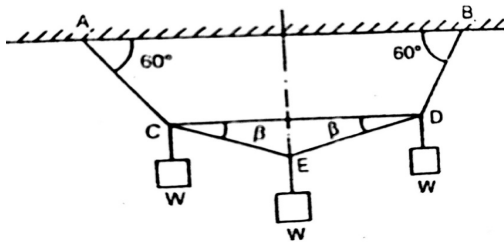
Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

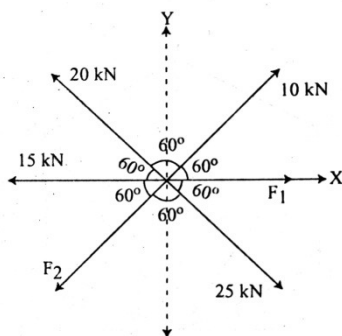
UNIT-I

1. a) On the string ABCDE are hung three equal weights, placed symmetrically with respect to the vertical line through the midpoint E as shown in fig. Determine angle β if the other angles are shown in fig. 6M



- b) State and prove Parallelogram law 6M
(OR)

2. a) Determine the unknown forces F_1 and F_2 for the force system as shown fig 6M

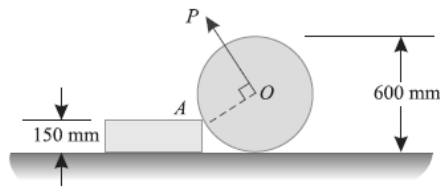


- b) Describe the procedure to find the resultant of concurrent force system 6M

UNIT-II

3. a) Explain the types of supports and indicate the unknown reactions they offer. 6M

- b) A uniform wheel of 600 mm diameter, weighing 5 kN rests against a rigid rectangular block of 150 mm height as shown in Fig. 6M

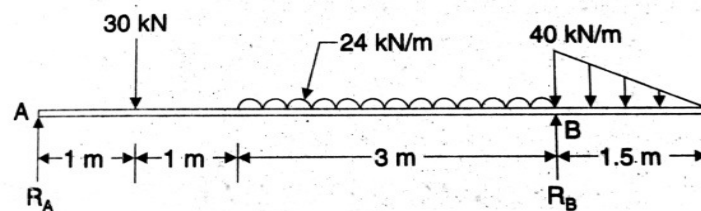


Find the least pull, through the centre of the wheel, required just to turn the wheel over the corner A of the block. Also find the reaction on the block. Take all the surfaces to be smooth.

(OR)

4. a) Determine the reactions at supports A and B of the overhanging beam 6M
as shown

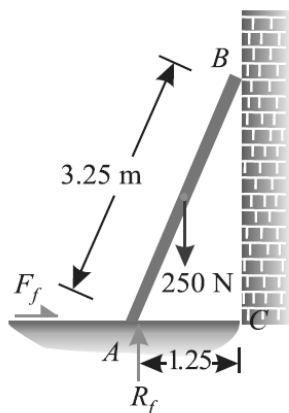
in fig



- b) Describe the procedure to find the resultant of parallel force system 6M
system

UNIT-III

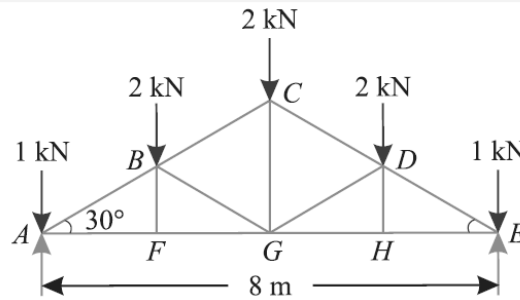
5. a) A uniform ladder of length 3.25 m and weighing 250 N is placed against a smooth vertical wall with its lower end 1.25 m from the wall. The coefficient of friction between the ladder and floor is 0.3. What is the frictional force acting on the ladder at the point of contact between the ladder and the floor? Show that the ladder will remain in equilibrium in this position. 8M



- b) Describe the following terms: 4M
- Limiting friction
 - Static friction
 - Angle of repose
 - Angle of friction

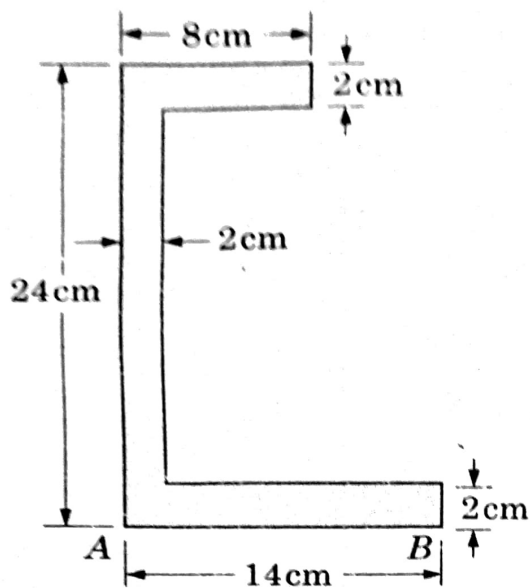
(OR)

6. a) State the applications of trusses. What are the assumptions of a perfect truss? 4M
- b) A king post truss of 8 m span is loaded as shown in Fig. Find the forces in each member of the truss and tabulate the results. 8M



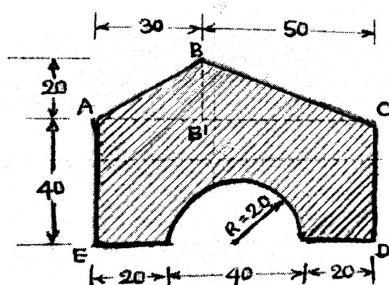
UNIT-IV

7. Determine the moments of inertia of the cross-section of an iron beam with respect to the centroidal axes parallel and perpendicular to the side AB. 12M



(OR)

8. Determine the Centroid of the given shaded area about its reference axis as shown in fig 12M



UNIT-V

9. a) Define and write an expression for normal and tangential accelerations of a particle. 6M
- b) A car enters a curved portion of the road of radius 300 m travelling at a constant speed of 54 km/hour. Determine the components of velocity and acceleration of the car in the x and y directions 18 seconds after it have entered the curved portion of the road. Also express the velocity and the acceleration of the car in terms of the normal and tangential components. 6M

(OR)

10. a) State the Newton's Laws of Motion of Rotation 6M
- b) A solid cylindrical pulley of mass 600 kg, having 0.6 m, radius of gyration and 1.5 m diameter, is rotated by an electric motor, which exerts a uniform torque of 60 kN-m. A body of mass 1.5 t is to lifted by a wire wrapped round the pulley. Find (i) acceleration of the body; and (ii) tension in the rope. 6M

4 of 4

**STRENGTH OF MATERIALS
(Mechanical Engineering)****Time: 3 Hours****Max Marks: 60**

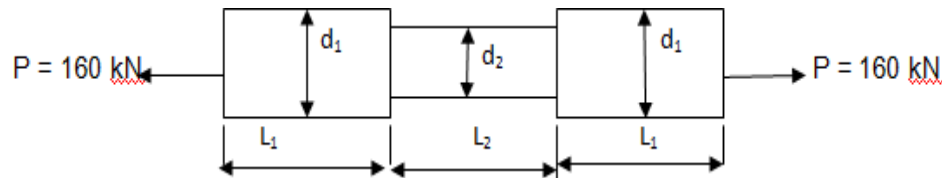
Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-I

1. The stepped circular steel bar shown in fig. is subjected to an axial load P of 12M
160kN. The stress in the middle portion is limited to 150MPa. Determine the
diameter and the length of middle portion, if the total elongation of the bar is
limited to 0.3mm. The modulus of elasticity for steel is 200GPa.

**(OR)**

2. A steel rail 10 m long is in the unstressed condition at 10^0 C. If the temperature of 12M
the rail is increased to 60^0 C, find the stress induced if there is no provision for the
expansion of the rail. Given $E = 200 \text{ GN/m}^2$ & $\alpha = 12 \times 10^{-6}/^0\text{C}$.

UNIT-II

3. Draw Shear force diagram and Bending moment diagram of a simply supported 12M
beam subjected to UDL of intensity 5 kN/m over its entire span.

(OR)

4. A beam 8.5m long rests on supports 5m apart. The right hand end overhang is 2m 12M
and left end overhang is 1.5m. It carries a uniformly distributed load of 50kN/m run
between the supports. A point load of 60kN acts at the extreme right end and
another point load 40kN acts at the left hand end. Construct the SFD and BMD and
state the position of the points of inflexion

UNIT-III

5. A timber beam of rectangular section supports a load of 20kN uniformly 12M
distributed over a span of 3.6m. If the depth of the beam section is twice the width
and the maximum bending stress is not to exceed 7.0Mpa, find the dimensions of
the beam section.

(OR)

6. The shear force acting on a section of a beam is 100kN. The section of the beam is 12M
of T-shaped with 200mm flange width and overall depth 250mm. The flange
thickness and web thickness are 50mm. Moment of inertia about its horizontal
neutral axis is $1.134 \times 10^8 \text{ mm}^4$. Find the shear stress at neutral axis and at the
junction of the web and flange.

UNIT-IV

7. A solid steel shaft has to transmit 75Kw power at 200 pm. Taking allowable shear stress 70Mpa. Find suitable dia of shaft with the maximum torque transmitted on each revolutions exceeds by mean by 30% 1.3 times mean. 12M

(OR)

8. Determine the crippling loads for a solid round bar 4 m long and 6 cm in diameter is used as a strut with following end conditions. 12M
(a) Both ends hinged (b) Both ends are fixed (c) one end fixed and other end free
(d) one end fixed and other end is hinged. Take $E = 2 \times 10^5 \text{ N/mm}^2$.

UNIT-V

9. A steel girder of uniform section, 12 meters long, is simply supported at its ends. It carries concentrated loads of 100 kN and 60 kN at two points 4 meters and 6.5meters from the two ends respectively. (a) Calculate the deflection of the girder at the two points under the two loads.(b) The maximum deflection. Use Macaulay's Method. Take: $I = 16 \times 10^4 \text{ m}^4$, and $E = 210 \times 10^6 \text{ KN/m}^2$. 12M

(OR)

10. a) State Mohr's theorem 4M
b) Determine the deflection at the free end of a cantilever beam carrying udl throughout the span. 8M

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) Establish Gauss Law in point form and integral form and hence deduce Laplace's and Poisson's Equations. 6M
- b) Explain about different types of charge distributions. 6M

(OR)

2. a) Derive the expression for electric field at any point due to infinite line charge. 6M
- b) Define Electric potential and derive the relationship between electric potential and electric field. 6M

UNIT-II

3. a) Discuss Maxwell's two equations for magneto static fields 6M
- b) Define Biot-Savart law? How it will useful to derive H? Explain? 6M

(OR)

4. 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) Find an expression for the magnetic field produced by a straight current carrying conductor at a distance x from it. 6M

UNIT-III

5. Derive the boundary conditions on tangential and normal components of electro static field at the boundary between two perfect dielectrics. 12M

(OR)

6. a) Write Maxwell's equations in different final forms and in word Statements. 6M
- b) If the magnetic field $\mathbf{H} = [3x\cos\beta + 6y\sin\alpha]\mathbf{a}_z$ Find current density J if fields are invariant with time. 6M

UNIT-IV

7. a) State and prove pointing theorem. 8M
- b) Explain wave propagation in lossless medium. 4M

(OR)

8. a) Derive expressions for describing the propagation of uniform plane waves in good conductors. 6M
- b) What is skin effect and skin depth and derive the expression for skin depth. 6M

UNIT-V

9. a) Explain i) Single stub and ii) Double stub Matching. 6M
- b) A transmission line has following parameters per km $R=15\Omega$, $C=15\mu F$, $L=1mH$, $G=1\mu S$ Find the additional inductance to give distortionless transmission. Calculate α and β for this inductance added transmission line. 6M

(OR)

10. a) Derive the expression for Input impedance of a transmission line. 8M
- b) A transmission line has $R=5\Omega/m$, $L=0.1\mu H$, $C=300pF$ and $G=0.01 S$ at 500MHz, determine α , β , Z_0 . 4M

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
$P(x)$	0	k	$2k$	$2k$	$3k$	K^2	$2K^2$	$7K^2+k$

Compute (i) $E(x)$ (ii) $V(X)$.

- b) Derive mean and variance of Poisson distribution. 6M

(OR)

2. a) Given the following table

X	-3	-2	-1	0	1	2	3
$P(x)$	0.05	0.15	0.30	0	0.30	0.15	0.05

Compute (i) $E(x)$, (ii) $E(2X+3)$ (iii) $V(X)$

- b) The probability that a pen will be defective is
- $1/10$
- . If 12 such pens are manufactured, find the probability that a) exactly two will be defective, b) at least two will be defective and c) none will be defective. 6M

UNIT-II

3. a) Let
- X
- be a continuous variate with p.d.f.
- $f(x) = \begin{cases} 12x^3 + 21x^2 + 10x & 0 \leq x \leq 1 \\ 0 & \text{otherwise} \end{cases}$
- , find 6M
-
- i)
- $p(x \leq 1/2)$
- and
- $p(x > 1/2)$
- ; ii) determine a number
- k
- such that
- $p(x \leq k) = 1/2$
- .

- b) The time required to assemble a piece of machinery is a random variable having approximately a normal distribution with
- $\mu = 12.9$
- minutes and
- $\sigma = 2.0$
- minutes. What are the probabilities that the assembly of a piece of machinery of this kind will take (i) at least 11.5 minutes; (ii) anywhere from 11.0 to 14.8 minutes. 6M

(OR)

4. a) A random variable
- X
- has the density function: 6M

$$f(x) = K \cdot (1-x^2) \text{ for } 0 < x < 1$$

$$= 0 \text{ otherwise.}$$

Find the value of K and that probability that random variable will take on a value

- i) between 0.1 and 0.2; ii) greater than 0.5.
-
- b) In a distribution of normal, 7% of items are under 35 and 89% are under 63. What are the mean and standard deviation of the distribution? 6M

UNIT-III

5. Construct sampling distribution of means for the population 2, 5, 9, 11 by drawing sample of size two with replacement. Determine (i) population mean 12M
-
- (ii) population variance (iii) the mean of sampling distribution of means (iv) standard error

(OR)

6. a) A random sample of 100 teachers in a large metropolitan area revealed a mean weekly salary of Rs. 487 with a standard deviation Rs.48. With what degree of confidence can we assert that the average weekly salary of all teachers in the metropolitan area is 502? 6M
- b) A company claims that its light bulbs are superior to those of its main competitor. If a study showed that a sample of $n_1=40$ of its bulbs has a mean lifetime of 1470 hours of continuous use with a standard deviation of 27 hours, while a sample of $n_2=40$ bulbs made by its main competitor had a mean lifetime of 1503 hours of continuous use with a standard deviation of 31 hours, does this substantiate the claim at the 0.05 level of significance? 6M

UNIT-IV

7. a) Ten specimens of copper wires drawn from a large lot have the following breaking strength: 578, 572, 570, 568, 572, 571, 570, 572, 596, and 548. Test whether the mean breaking strength of the lot may be taken be 578kg. Assume 0.05 level? 6M
- b) Two sales men A and B are working in a certain district. From a sample survey conducted by head office, the following results were obtained. State whether there is any significant difference in the average sales between two sales men. 6M

No of sales	20	18
Average sales (in Rs.)	170	205
Standard deviation (in Rs)	20	25

(OR)

8. Mechanical engineers, testing a new arc welding technique, classified welds both with respect to appearance and an x-ray inspection. 12M

x-ray	Appearance				
		bad	Appearance normal	good	total
	Bad	20	7	3	30
	Normal	13	51	16	80
	Good	7	12	21	40
	Total	40	70	40	150

Test for independence using $\alpha = 0.05$ and find the individual cell contributions to the chi-square test statistics.

UNIT-V

9. a) For 10 randomly selected observations, the following data were obtained. Fit y on x regression line. 6M

Over time hours (x)	1	1	2	2	3	3	4	5	6	7
Additional hours (y)	2	7	7	10	8	12	10	14	11	14

- b) Determine the constants a and b by the method of least squares such that $y = a.e^{bx}$. 6M

x	2	4	6	8	10	12
y	4.077	11.084	30.128	81.897	222.629	441.987

(OR)

10. a) Calculate the coefficient of correlation for the ages of husbands and wives. 6M

Age of husband (in years)	23	27	28	29	30	31	33	35	36	39
Age of Wife (in years)	18	22	23	24	25	26	28	29	30	32

- b) The following table provides data about the percentage of students who have free university meals (x) and their CGPA scores (y). Calculate the Spearman's Rank Correlation between the two. 6M

State University	Pune	Chennai	Delhi	Kanpur	Ahmadabad	Indoor	Guwahati
x	14.4	7.2	27.5	33.8	38.0	15.9	4.9
y	54	64	44	32	37	68	62

AR16

CODE: 16BS2006

SET-1

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

II B.Tech II Semester Supplementary Examinations, September-2022

COMPLEX VARIABLES AND STATISTICAL METHODS

(Common for CIVIL & MECH)

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) If $f(z)$ is a regular function of z , prove that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right)|f(z)|^2 = 4|f'(z)|^2$ 7M
- b) Show that z^n is an analytic function. Hence find its derivative. 7M
- (OR)
2. Find the analytic function and its imaginary part whose real part is $\frac{\sin 2x}{\cosh 2y - \cos 2x}$ by Milne-Thompson method 14M

UNIT-II

3. Evaluate $\oint_C \frac{e^z}{(z^2 + \pi^2)^2} dz$ where C is $|z| = 4$. 14M
- (OR)
4. Evaluate by Residue theorem $\oint_C \frac{3z^2 + z + 1}{(z^2 - 1)(z + 3)} dz$ where C is $|z| = 2$. 14M

UNIT-III

5. Expand the Laurent series expansion of the function $f(z) = \frac{1}{(z-1)(z-2)}$ 14M
- in the region i) $|z| < 1$, ii) $1 < |z| < 2$, iii) $|z| > 2$
- (OR)
6. Expand the Laurent series expansion of the function $f(z) = \frac{z^2 - 1}{z^2 + 5z + 6}$ about $z = 0$ in the region $2 < |z| < 3$. 14M

UNIT-IV

7. a) There are 3 true coins and 1 false coin with 'head' on both sides. A coin is chosen at random and tossed 4 times. If 'head' occurs all the 4 times. What is the probability that the false coin has been chosen and used? 7M
- b) A discrete random variable X has the following probability distribution. 7M

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

(OR)

8. a) Out of 800 families with 5 children each, how many families would be expected to have 7M
- (i) three boys (ii) five girls (iii) either 2 or 3 boys (iv) at least one boy.
- b) In a Normal distribution, 31% of the items are under 45 and 8% are over 64. Determine the mean and standard deviation of the distribution. 7M

UNIT-V

9. a) Compute the coefficient of correlation between X and Y using the following data. 7M

X	65	67	66	71	67	70	68	69
Y	67	68	68	70	64	67	72	70

- b) The equations of two regression lines obtained in a correlation analysis are 7M
- $3x + 12y = 19$, $3y + 9x = 46$. Obtain correlation co-efficient between x and y

(OR)

10. a) Fit a second degree parabola to the following data. 7M

x	1	2	3	4	5	6	7	8	9
y	2	6	7	8	10	11	11	10	9

- b) Fit a straight line to the following data by the method of least squares 7M

x	1	2	3	4	5
f	2	5	4	9	10

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) If $w = \log(z)$, find $\frac{dw}{dz}$ and determine where w is non analytic. 7M
- b) If $f(z)$ is a regular function of z , prove that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right)|f(z)|^2 = 4|f'(z)|^2$ 7M
- (OR)**
2. Find the analytic function whose imaginary part is $\frac{\sin x \sin y}{\cos 2x + \cosh 2y}$ 14M

UNIT-II

3. Evaluate $\int_0^{2+i} (\bar{z})^2 dz$ along (i) the line $y = x/2$ (ii) the real axis 2 to and then vertically to $2+i$. 14M
- (OR)**
4. Evaluate $\oint_C \frac{\sin^2 z}{\left(z - \frac{\pi}{6}\right)^2} dz$, where C is the circle $|z| = 1$ using Cauchy's integral formula. 14M

UNIT-III

5. Expand $f(z) = \frac{1}{(z-1)(z-2)}$ as a Laurents series in the region i) $|z| < 1$, ii) $1 < |z| < 2$, (iii) $|z| > 2$. 14M
- (OR)**
6. a) Find the nature and location of singularities of $(i) \frac{1}{1-e^z}$ (ii) $\frac{1}{z^2} e^{\frac{1}{z}}$ 7M
- b) Expand $f(z) = \frac{1 - \cos z}{z^3}$ about $z=0$ as a Laurents series. 7M

UNIT-IV

7. Find the residue of $f(z) = \frac{z^3}{(z-1)^4(z-2)(z-3)}$ at its poles and hence evaluate $\oint_C f(z) dz$ where C is the circle $|z|=2.5$ 14M

(OR)

8. Show that $\int_0^{2\pi} \frac{\cos 3\theta}{5-4\cos \theta} d\theta = \frac{\pi}{12}$ 14M

UNIT-V

9. a) Prove that $\int_0^1 \frac{x dx}{\sqrt{1-x^5}} = \frac{1}{5} \beta\left(\frac{2}{5}, \frac{1}{2}\right)$ 7M
- b) Show that $\int_0^\infty \frac{x^{10} - x^8}{(1+x)^{30}} dx = 0$ 7M

(OR)

10. a) Prove that $\int_0^1 \frac{x^2 dx}{\sqrt{1-x^4}} \times \int_0^1 \frac{dx}{\sqrt{1+x^4}} = \frac{\pi}{4\sqrt{2}}$ 14M

AR16

CODE: 16EC2008

SET-1

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

II B.Tech II Semester Supplementary Examinations, September-2022

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 Coulomb's Law. Derive the expression for Coulomb's law to calculate the magnitude of the force between two charges. **7M**

- b) Point charges 5mC and -4mC are located at (3,2,-1) and (-1,-1,4) respectively. Calculate the electric field intensity on 20 nC charge located at (0,3,1) and the electric field intensity at the point. **7M**

(OR)

2. a) Using Gauss' law derive expression for electric field intensity and electric flux density due to an infinite sheet of conductor of charge. **7M**
- b) Calculate the electric field at a distance 'r' because of two charge particles +Q & -Q separated by a small distance 'd' symmetrically on either side of the origin. **7M**

UNIT-II

3. a) Derive an expression for force between two straight long parallel current carrying conductors. What will be the nature of force if the currents are in the same and opposite direction **7M**

- b) With necessary equation explain "*law of conservation of magnetic flux*" **7M**

(OR)

4. a) An infinitely long current element on x- axis carries a current of 1.0mA in \mathbf{a}_x direction. Determine H at the point P(5,2,1) **7M**
- b) Derive the conditions of magnetic field at boundary surface of dielectric-dielectric interface. **7M**

UNIT-III

5. a) Explain Faraday's Law for Time Varying Fields. **7M**
- b) Two extensive homogeneous isotropic dielectrics meet on a plane $z=0$. For $z \geq 0$, $\epsilon_{r1}=4$ and for $z \leq 0$, $\epsilon_{r2}=3$. A uniform electric field $\mathbf{E}_1=5\mathbf{a}_x-2\mathbf{a}_y+3\mathbf{a}_z$ kV/m exists for $z \geq 0$. **7M**

a) Find \mathbf{E}_2 $z \leq 0$ b) the angles \mathbf{E}_1 and \mathbf{E}_2 make with the interface.

(OR)

6. a) Verify that the displacement current in parallel plate capacitor is as same as the conduction current in the conducting wires. **7M**
- b) In free space, the magnetic field of an EM wave is given by $\mathbf{H}=0.4\omega\epsilon_0 \cos(\omega t-50x)$ \mathbf{a}_z A/m. Find the electric field and displacement current density. **7M**

UNIT-IV

7. a) Explain the significances of Poynting theorem and derive the expression of Poynting vector . Does the Poynting theorem apply to static field? Explain **7M**
b) Define a Uniform Plane Wave and establish a wave equation for a conducting medium & derive the propagation characteristics of a good conductor **7M**
- (OR)**
8. With neat sketches, define and distinguish between vertical and horizontal polarizations, when a uniform plane wave is obliquely incident on a perfect dielectric medium from air, with relevant schematics. **14M**

UNIT-V

9. a) Define characteristic impedance and propagation constants of transmission line and obtain for lossless condition **7M**
b) A lossless transmission line with $z_0=50\Omega$ is 30m long and operates at 2MHz. The line is terminated with a load $Z_L= 60+j40\Omega$. If $u=0.6c$ on the line, find the a) reflection coefficient , b) the standing wave ratio, and input impedance. **7M**
- (OR)**
10. a) Illustrate the procedure to design the double stub. **7M**
b) The antenna with an impedance of $40+j30\Omega$ is to be matched to a load 100Ω lossless line with a shorted stub. Determine **7M**
a) The required stub admittance
b) The distance between the stub and the antenna
c) The length of the stub.

AR16

CODE: 16CS2007

SET-1

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

II B.Tech II Semester Supplementary Examinations, September-2022

FORMAL LANGUAGES AND AUTOMATA THEORY

(Common to CSE & IT)

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) Design DFA to accept strings with 'c' and 'd' such that number of d's are divisible by 4. 7 M
b) Explain the procedure for converting NFA to DFA. 7 M
(OR)
2. a) Let $\Sigma = \{a, b\}$, a) Give DFA that accepts any string with "aababb" as a substring. 7 M
b) What is a Finite state machine? Give the mathematical representation of FSM. 7 M
Explain each component.

UNIT-II

3. a) Define Regular Expression? Explain about the properties of Regular Expressions. 7 M
b) Give a regular expression that generates the language L over the alphabet $\Sigma = \{a, b\}$ where each b in the string is followed by exactly one or three a's. 7 M
(OR)
4. a) Show that $L = \{a^{2n} | n < 0\}$ is Regular. 7 M
b) What is relationship between finite automata and regular expression? Explain the process of converting DFA to regular expression. 7 M

UNIT-III

5. a) Construct Griebach Normal Form Equivalent to the context free grammar 7 M
 $S \rightarrow ASB/AB,$
 $A \rightarrow a,$
 $B \rightarrow b$
b) Define Context Free Grammar. State and Explain the closure properties of CFG. 7 M
(OR)
6. a) Consider the CFG with $\{S, A, B\}$ as the non-terminal alphabet, $\{a, b\}$ as the terminal alphabet, S as the start symbol and the following set of production rules 7 M
 $S \rightarrow ASA \mid aB \mid b$
 $A \rightarrow B$
 $B \rightarrow b \mid \epsilon$
Find a reduced grammar equivalent to the above grammar.
b) Elaborate on left most derivation and right most derivation. 7 M

UNIT-IV

7. a) How to convert the following grammar to PDA that accepts the same language by empty stack
S \rightarrow 0AA
A \rightarrow 0S/1S/0 7 M
- b) Define Push Down Automata. Explain the basic structure of PDA with a neat graphical representation. 7 M
- (OR)**
8. a) Construct a PDA that accepts $L = \{0^n 1^n \mid n \geq 0\}$ 7 M
- b) What is Deterministic PDA? Differentiate acceptance by final state and acceptance by empty state. 7 M

UNIT-V

9. a) Design a Turing Machine to accept the set of all palindrome over $\{0,1\}^*$. Draw the Transition diagram for the same. 7 M
- b) Explain the design of universal Turing machine with its halting problem. 7 M
- (OR)**
10. a) Why a Turing machine is called Linear Bounded Automata? Discuss the advantages of Linear Bounded Automata. 7 M
- b) Design a turing machines and its transition diagram to accept language greeted by $\{a^i b^j c^k \mid i,j,k \in \mathbb{N}, i+k=j\}$. 7 M

Time: 3 Hours**Max Marks: 70****PART-A****ANSWER ALL QUESTIONS****[1 x 10 = 10 M]**

1. a) Give Cauchy – Riemann equations in polar form
- b) Define entire function
- c) Find the zeros and poles of the function $f(z) = \frac{1+z}{(1-z)^2}$
- d) Find the residue of $f(z) = \frac{1+z}{z^2(z-2)}$ at $z = 2$
- e) Determine the fixed points of $f(z) = \frac{6z-9}{z}$
- f) Define Bilinear transformation
- g) Determine $E[(4X+3)^2]$ when $E(X^2) = 3$ and $E(X) = 2$
- h) Write any two important properties of moment generating function
- i) Define standard error of sampling distribution of test statistic
- j) Define Null and Alternative Hypothesis

PART-B**Answer one question from each unit****[5x12=60M]****UNIT-I**

2. a) If $w = \log z$, determine $\frac{dw}{dz}$ and find where w is non-analytic 6M
- b) Evaluate $\int_C \frac{e^{2z}}{(z-1)(z-2)} dz$ where C is the circle $|z| = 3$ 6M

(OR)

3. Prove that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right) |\operatorname{Re} f(z)|^2 = 2 |f'(z)|^2$ where $w = f(z)$ is analytic 12M

UNIT-II

4. a) Evaluate the integral $\int_0^{2\pi} \frac{d\theta}{2 - \sin \theta}$ 8M
- b) Find the residue of $\frac{ze^z}{(z-1)^3}$ at its pole 4M

(OR)

5. a) Prove that $\int_{-\infty}^{\infty} \frac{\cos(ax)}{x^2+1} dx = \pi e^{-a}, a \geq 0$ 6M
- b) Evaluate $\int_C \frac{e^{-2z} z^2}{(z-1)^3 (z+2)} dz$ where C is $|z+2|=1$ using Cauchy's integral formula 6M

UNIT-III

6. a) Find the image of the circle $|z|=2$ under the transformation $w = z + 3 + 2i$ 6M
- b) Find the bilinear transformation that maps the points $(0,1,\infty)$ in z -plane onto the points $(-1, -2, -i)$ in the w -plane 6M

(OR)

7. a) Under the transformation $w = \frac{z-i}{1-iz}$, find the image of the circle $|z|=1$ in the w -plane 6M
- b) Under the transformation $w = \frac{1}{z}$, find the image of the circle $|z-2i|=2$ in the w -plane 6M

UNIT-IV

8. a) A random variable X has the following probability function 6M
- | | | | | | | |
|-----------------------|-----|-----|-----|------|-----|-----|
| Values of X , x : | -2 | -1 | 0 | 1 | 2 | 3 |
| $P(x)$: | 0.1 | k | 0.2 | $2k$ | 0.3 | k |
- i) Find the value of k ii) Calculate mean and variance of X
- b) If X is a Poisson variate such that $P(X=2) = 9P(X=4) + 90P(X=6)$ 6M
- i) Find λ ii) Find the mean of X

(OR)

9. If X is normal variate with mean 30 and standard deviation 5. Find the probabilities that i) $26 \leq X \leq 40$, ii) $X \geq 45$, iii) $|X-30| > 5$ 12M

UNIT-V

10. Two independent random samples of 8 and 7 items respectively had the following values 12M
- Sample I : 9 11 13 11 15 9 12 14
- Sample II : 10 12 10 14 9 8 10
- Do the estimates of population variance differ significantly

(OR)

11. a) A random sample of 500 apples was taken from a large consignment and 60 were found to be bad. Obtain the 98% confidence limits for the percentage of bad apples in the consignment 6M
- b) A sample of 900 members has a mean 3.4 cms and standard deviation 2.61 cms. Is the sample from a large population of mean 3.25 cms and Standard deviation 2.61 cms. 6M