

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. Show that the function $f(z) = \sqrt{|xy|}$ is not analytic at the origin even though Cauchy Riemann equation are satisfied thereof.

Marks	CO	Blooms Level
10M	CO1	Apply K3

(OR)

2. Determine the analytic function $f(z) = u + iv$, if $u - v = \frac{\cos x + \sin x - e^{-y}}{2(\cos x - \cosh y)}$ and $f\left(\frac{\pi}{2}\right) = 0$

10M	CO1	Apply K3
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UNIT-II

3. Find the poles and residue of the function $f(z) = \frac{1}{z^4 + 5z^2 + 6}$

Marks	CO	Blooms Level
10M	CO2	Apply K3

(OR)

4. Evaluate $\int_0^{1+i} (x - y + ix^2) dz$ along the line joining $z = 0$ and $z = 1 + i$

10M	CO2	Evaluate K3
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UNIT-III

5. Show that $\int_0^{2\pi} \frac{d\theta}{2 + \cos \theta} = \frac{2\pi}{\sqrt{3}}$

Marks	CO	Blooms Level
10M	CO3	Apply K3

(OR)

6. Evaluate $\oint_C \frac{z-3}{z^2+2z+5}$ where C is the circle. (i) $|z| = 1$, (ii) $|z + 1 - i| = 2$

10M	CO3	Apply K3
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UNIT-IV

7. It has been claimed that in 60% of all solar-heat installation the utility bill is reduced by at least one-third. Accordingly, what are the probabilities that the utility bill will be reduced by at least one-third in
a) four of five installation ;
b) at least four of five installation?

Marks	CO	Blooms Level
10M	CO4	Apply K3

(OR)

8. With an eye toward improving performance, industrial engineers study the ability of scanners to read the bar codes of various food and household products. The maximum reduction in power, occurring just before the scanner cannot read the bar code at a fixed distance, is called the maximum attenuation. This quantity, measured in decibels, varies from product to product. After collecting considerable data, the engineers decided to model the variation in maximum attenuation as a normal distribution with mean 10.1 dB and standard deviation 2.7dB.
(a) $P(8.5 \leq X \leq 13)$ & (b) $P(X \geq 15.1)$

10M CO4 Apply K3

UNIT-V

9. Find the mean, standard deviation and the mean of the sampling distribution of means of population consisting of 4 numbers 2,3,4,5 by drawing samples of two with replacement.
(OR)
10. A treatment plant that sends effluent into the river claims the mean suspended solids is never above 40 mg/l. Measurement of the suspended solids in river water on $n = 14$ Monday morning yield $\bar{x} = 46$ and $s = 9.4 \frac{\text{mg}}{\text{l}}$. Based on data collected over a period of many years, it is reasonable to assume that the individual measurement follow a normal distribution. Do the data support of refund the treatment plant's claim?

Marks CO Blooms Level

10M CO5 Apply K3

10M CO5 Analysis K3

UNIT-VI

11. Is gender independent of education level? A random sample of 365 people were surveyed and each person was asked to report the highest education level of obtained. The data that resulted from the survey is summarized in the following table: By using chi-square distribution at 5% level of significance.

Marks CO Blooms Level
10M CO6 Analysis K3

	High school	Bachelors	Masters	Ph.D.	Total
Female	60	54	46	41	201
Male	40	44	53	57	194
Total	100	98	99	98	395

(OR)

12. Nadir is testing an octahedral die to see if it biased. The results are given in the table below.

10M CO6 Analysis K3

Score	1	2	3	4	5	6	7	8
Frequency	7	10	11	9	12	10	14	7

Test the hypothesis that the die is fair.

Time: 3 Hours

Max Marks: 60

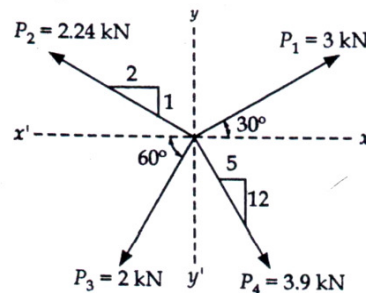
Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-IMarks CO Blooms
Level

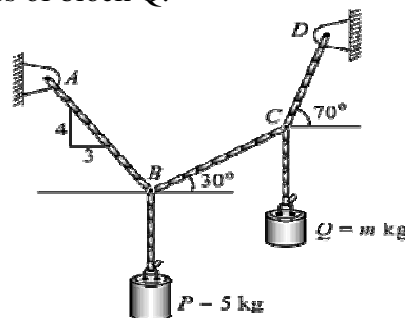
1. Determine the resultant, both in magnitude and direction, of the four forces acting on the body as shown in Fig.



10M CO1 L2

(OR)

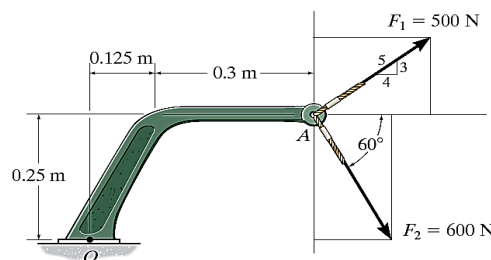
2. Block P 5 kg and block Q of mass m kg are suspended through the chord which is in the equilibrium position, as shown in Figure. Determine the mass of block Q.



10M CO1 L2

UNIT-IIMarks CO Blooms
Level

3. Determine the resultant moment produced by the forces about point O?

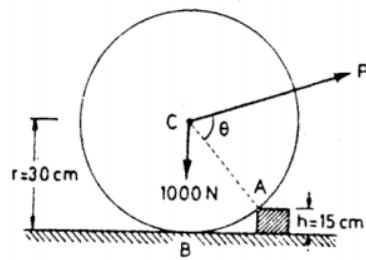


10M CO2 L3

(OR)

4. A uniform wheel of 60cm diameter weighing 1000N rests against a rectangular obstacle 15cm high. Find the least force required which when acting through the center of the wheel will just turn the wheel over the corner of the block. Also, find the angle θ which this least force shall make with AC.

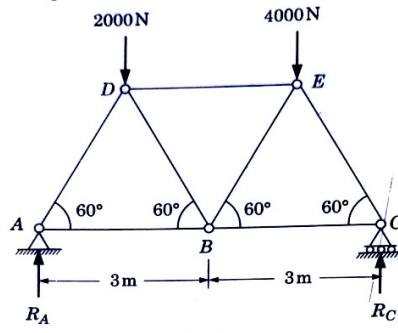
10M CO2 L2



UNIT-III

Marks CO Blooms Level

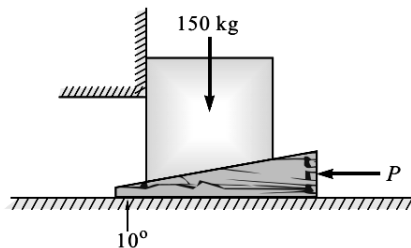
5. Using the method of joints, find the axial forces in all the members of a truss with the loading shown in Fig.



10M CO3 L3

(OR)

6. A block of mass 150 kg is raised by a 10° -wedge weighing 50 kg under it and by applying a horizontal force at it as shown in Figure. Taking coefficient of friction between all surfaces of contact as 0.3, find minimum force that should be applied to raise the block.

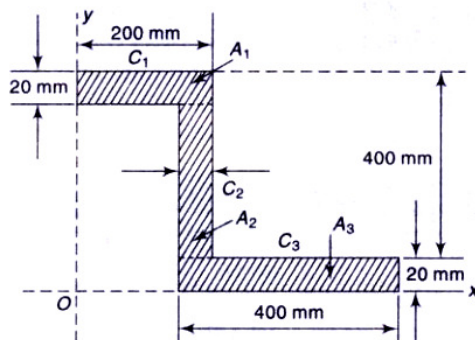


10M CO3 L3

UNIT-IV

Marks CO Blooms Level

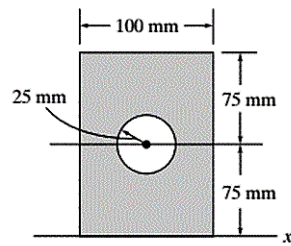
7. Find the centroid of the following shaded plane areas shown in figure.



10M CO4 L3

(OR)

8. Determine the moment of inertia of the area shown in the figure about its centroidal axis.



10M CO4 L3

UNIT-V

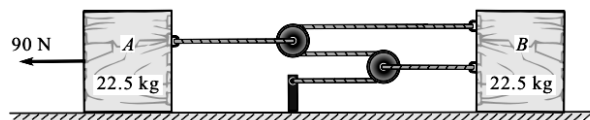
9. Driver of a car travelling at 72km/hour observes the light 300 m ahead of him turning red. The traffic light is timed red for 20 sec before it turns green. If the motorist wishes to pass the lights without stopping to wait for it to turn green, determine (a) the required uniform acceleration of the car (b) the speed with which the motorist crosses the traffic light

Marks CO Blooms Level

10M CO5 L4

(OR)

10. A system shown in Figure is at rest initially. Neglecting friction determine velocity of block A after it has moved 2.7 m when pulled by a force of 90 N.

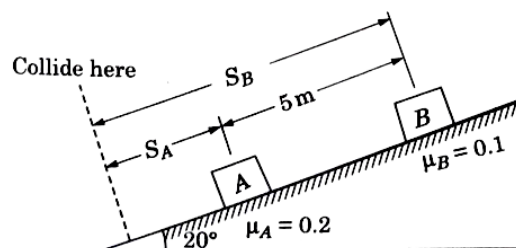


10M CO5 L4

UNIT-VI

11. Two blocks A & B are held on a inclined plane 5 m apart as shown in fig. The coefficients of friction between the blocks A, B and the inclined plane are 0.2 & 0.1 respectively. If the blocks begin to slide down the plane simultaneously, calculate the time & distance travelled by each block before collision.

Marks CO Blooms Level

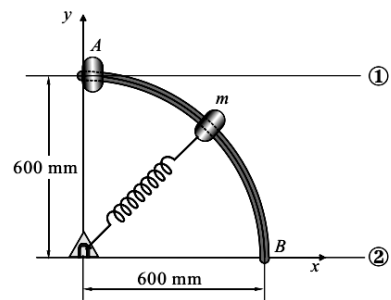


10M CO6 L3

(OR)

12. The mass $m = 1.8$ kg slides from rest at A along the frictionless rod bent into a quarter circle. The spring with modulus $k = 16$ N/m has an unstretched length of 400 mm.
(i) Determine the speed of m at B.
(ii) If the path is elliptical, what is the speed at B.

10M CO6 L3



4 of 4

**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.	a. Discuss the advantage of reheating the steam in high pressure steam plants.	5	1	Understand
	b. Explain Regenerative Rankine cycle and discuss its advantages and disadvantages of over Simple Rankine cycle.	5	1	Understand
(OR)				
2.	A steam power plant operates on a theoretical reheat cycle. Steam at boiler at 150bar, 550 ⁰ C expands through the high-pressure turbine. It is reheated at a constant pressure of 40bar to 550 ⁰ C and expands through the low-pressure turbine to a condenser at 0.1bar. Draw T-s and h-s diagrams. Find: i) find quality of steam at turbine exhaust; ii) cycle efficiency; iii) steam rate in kg/kWh.	10	1	Apply
<u>UNIT-II</u>		Marks	CO	Blooms Level
3.	a. List the essentials of a good steam boiler, Estimate the factors which should be considered while selecting a boiler.	5	2	Understand
	b. List out the classifications of boilers.	5	2	Understand
(OR)				
4.	Explain why the blow-off cock is operated periodically when the boiler is working. Where is it located? Explain its working with a neat sketch.	10	2	Understand
<u>UNIT-III</u>		Marks	CO	Blooms Level
5.	a. Discuss the merits and demerits of surface condensers over jet condensers.	5	3	Understand
	b. Explain the classification and working principle of a nozzle.	5	3	Understand
(OR)				
6.	Steam from nozzle enters into a single stage impulse turbine at 300 m/s absolute velocity. The nozzle angle=25 ⁰ . The blade rotor mean diameter is 100cm and rotating at a speed of 2000 rpm. Find the blade angles if the axial thrust is zero. Find the power developed when the steam flow rate is 600 kg/min. Take blade velocity coefficient=0.9.	10	3	Apply

<u>UNIT-IV</u>		Marks	CO	Blooms Level
7.	In a reaction turbine, the blade tips are inclined at 35° and 20° in the direction of motion. The guide blades are of same shape as that of the moving blades, but reversed in direction. At a certain place in the turbine, the drum diameter is 1m and the blades are 10 cm high. At this place, the steam has a pressure of 1.75 bar and dryness fraction of 0.935. If the speed of this turbine is 250 rpm and the steam passes through the blades without shock, find the mass of steam flow and power developed in the ring of moving blades.	10	4	Analyse

(OR)

8.	List out the classifications of steam turbines. Explain the difference between impulse and reaction turbine	10	4	Analyse
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<u>UNIT-V</u>		Marks	CO	Blooms Level
9.	a. Explain the merits and demerits of closed and semi-closed cycle gas turbines.	5	5	Understand
	b. Draw the T-S diagram of actual gas turbine plant indicating its processes.	5	5	Apply

(OR)

10.	In gas turbine plant, the compressor takes air at 15°C and compresses with pressure ratio of 4 with isentropic efficiency 82%. Then the air is heated in the heat exchanger using 75% of the available heat with exhaust gases and then heated in combustion chamber to 600°C . Isentropic efficiency of turbine is 70%. Taking the properties of air and gases same, find work developed per kg of air flow and thermal efficiency of the cycle; Take effectiveness of heat exchanger as 0.75.	10	5	Analyse
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<u>UNIT-VI</u>		Marks	CO	Blooms Level
11.	Illustrate the following terms a) Evaporative Cooling b) Air Washer c) Chemical (Desiccant) humidification.	10	6	Apply
(OR)				
12.	Define the following. i) Psychrometry ii) Specific Humidity iii) Relative humidity iv) Dry bulb temperature v) Wet bulb temperature	10	6	Understand

Time: 3 Hours

Max Marks: 60

Answer ONE Question from each Unit

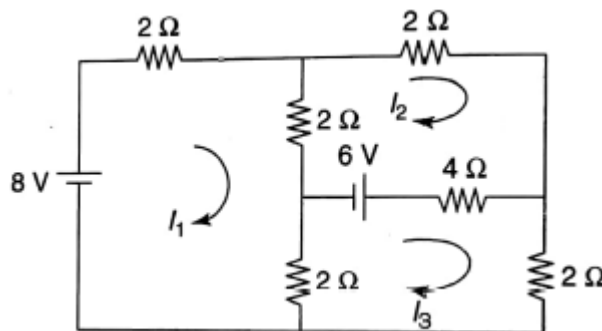
All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-I

1. a Find the current through the 4Ω resistor in the given network.

Marks	CO	Blooms Level
5	1	3



- b. State and prove the Thevins and Norton's Theorems

5	1	2
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(OR)

2. Compute the voltage across 6Ω resistor in the circuit shown in Fig-2 using Thevenin's Theorem.

10	1	3
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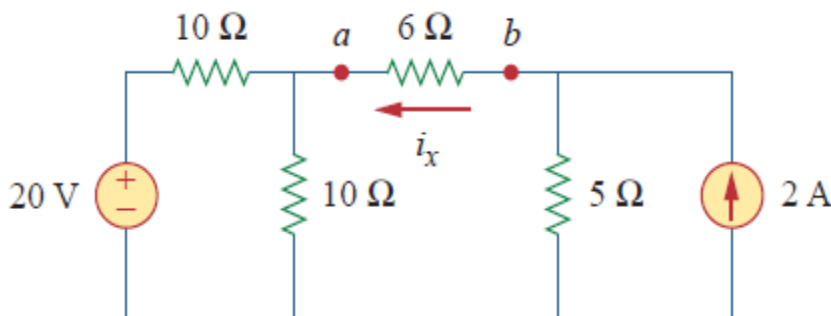


Fig-2

UNIT-II

3. Determine the value of the load resistance R_L for the circuit shown in Fig-3 which gives maximum power dissipation and the value of the power.

Marks	CO	Blooms Level
10	2	3

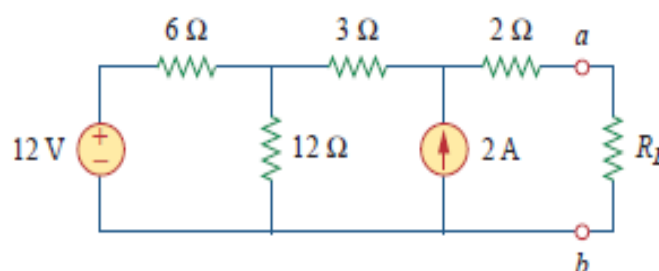


Fig-3

(OR)

4. a Verify the compensation theorem for the circuit shown in fig-4. 5 2 2

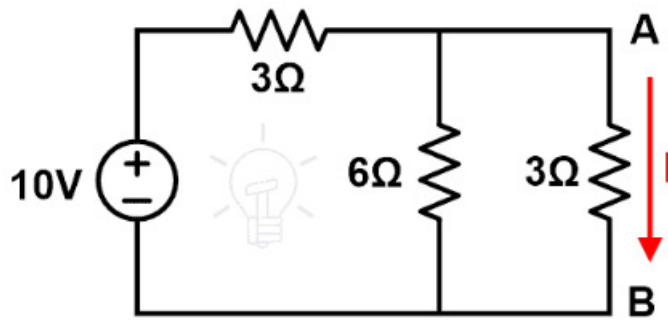


fig 4

- b Verify the reciprocity theorem for the circuit shown in figure 5. 5 2 2

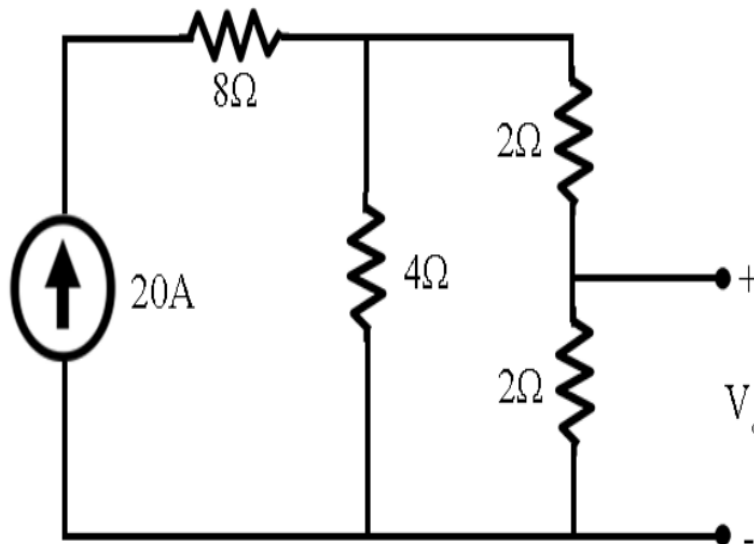


fig 5

UNIT-III

5. Compute the transmission parameters of the network shown in Fig-6.

Marks	CO	Blooms Level
10	3	2

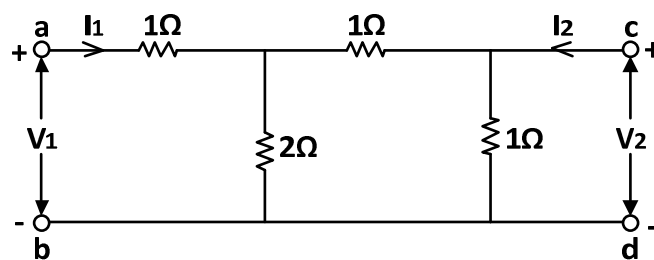
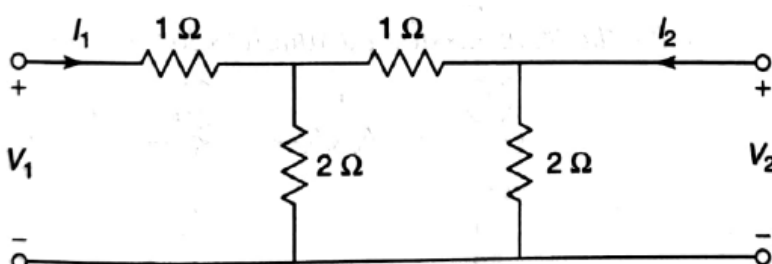


Fig-6

(OR)

6. a) Drive the condition for Reciprocity and Symmetry for the h-parameters. 5 3 2
- b) Obtain ABCD parameters for the given network. 5 3 2



UNIT-IV

Marks	CO	Blooms Level
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7. a Compute the resonance frequency for the circuit shown in figure-8.

5	4	3
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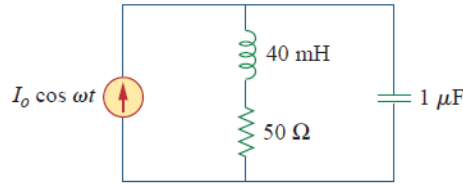


fig-8

- b A series RLC circuit with $R=65\ \Omega$, $L=8\text{mH}$, and $C=40\mu\text{F}$ has an applied voltage of 150V at variable frequency. Frequency is varied until the voltage across the capacitor becomes maximum. Determine frequency and capacitor voltage.

5	4	2
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(OR)

8. An impedance $Z_1 = (10+j10)\ \Omega$ is connected in parallel with another impedance of resistance $8.5\ \Omega$ and variable capacitance connected in series. Find capacitance 'C' such that the circuit is resonant at 5 KHz.

10	4	2
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UNIT-V

Marks	CO	Blooms Level
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9. a The nominal impedance of a low pass π section filter is $500\ \Omega$ and its cut-off frequency is at 100kHz. Compute the value of characteristic impedance of the section at a frequency of 90 kHz and the value of characteristic impedance of the equivalent low-pass T-section filter.

5	5	2
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- b Design an m-derived T-section low-pass filter having cut-off frequency of 800Hz, design impedance of $500\ \Omega$ and frequency of attenuation of 1000Hz.

5	5	2
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(OR)

10. Explain about constant k-low pass filter and derive the expression for attenuation and phase constants.

10	5	1
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UNIT-VI

Marks	CO	Blooms Level
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11. a) Derive the response for R-L network for internal energy excitation.

5	6	2
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- b) Derive the response for RC network for DC voltage excitation.

5	6	2
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(OR)

12. For the network shown in fig 10, determine the current $i(t)$ when the switch is closed at $t=0$ with zero initial conditions.

10	6	3
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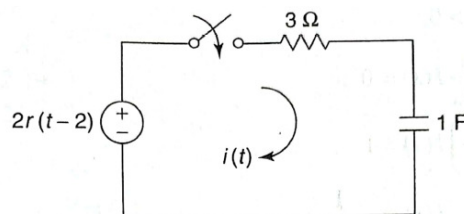


fig-10

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

			Marks	CO	Blooms ms Level
<u>UNIT-I</u>					
1.	a	The average number of accidents at a level-crossing every year is 5. Calculate the probability that there are exactly 3 accidents there this year.	5M	1	3
	b	A player tosses 3 fair coins. He wins Rs.500 if 3 heads appear, Rs.300 if 2 heads appear, Rs.100 if 1 head occurs. On the other hand, he loses Rs.1500 if 3 tails occur. Obtain the expected value of the gain of the player. Is it favourable?	5M	1	3
(OR)					
2.	a	Determine mean and variance of Binomial distribution	5M	1	2
	b	A radioactive source emits 4 particles on average during a five-second period. i) Calculate the probability that it emits 3 particles during a 5-second period. ii) Calculate the probability that it emits at least one particle during a 5-second period. iii) During a ten-second period, what is the probability that 6 particles are emitted?		1	3
<u>UNIT-II</u>					
3.	a	The probability density function $f(x)$ of a continuous random variable is given by $f(x) = c \cdot e^{- x }, -\infty < x < +\infty$. Show that $c=1/2$ and find that the mean and variance of the distribution. Also determine the probability that the variate lies between 0 and 4	5M	2	3
	b	A research scientist reports that mice will live on average of 40 months when their diets are sharply restricted and then enriched with vitamins and proteins. Assuming that the life times of such mice are normally distributed with a standard deviation of 6.3 months, find the probability that a given mouse will live a) more than 32 Months b) less than 28 months	5M	2	3
(OR)					
4.	a	Let X be a random variable with PDF given by $f(x)=cx^2 \quad x \leq 1$ 0, otherwise a. Find the constant c. b.Find $E(X)$ and $Var(X)$ c. Find $P(X \geq 12)$.	5M	2	3
	b	he marks obtained in mathematics by 1000 students are normally distributed with mean 78% and standard deviation 11%. Determine (i) How many students got marks above 90 %? (ii) What was the highest mark obtained by the lowest 10% of the students?	5M	2	3
<u>UNIT-III</u>					
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	10M	3	
3(OR)					

6. Suppose a random sample of size $n = 100$ has been selected and the sample mean is found to be $\bar{x} = 67$. The population standard deviation is assumed to be $\sigma = 12$. Please answer the following questions. 10M 3

- (a) What is the standard error of the mean $\sigma_{\bar{x}}$?
(b) What is the margin of error if the confidence level is $(1 - \alpha) = 0.95$?

3 UNIT-IV

7. a It is hoped that a newly developed pain reliever will more quickly produce perceptible reduction in pain to patients after minor surgeries than a standard pain reliever. The standard pain reliever is known to bring relief in an average of 3.5 minutes with standard deviation 2.1 minutes. To test whether the new pain reliever works more quickly than the standard one, 50 patients with minor surgeries were given the new pain reliever and their times to relief were recorded. The experiment yielded sample mean $\bar{x} = 3.1$ minutes and sample standard deviation $s = 1.5$ minutes. Is there sufficient evidence in the sample to indicate, at the 5% level of significance, that the newly developed pain reliever does deliver perceptible relief more quickly? 10M 4 3

(OR)

8. 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? 10M 4 3

UNIT-V

9. Two brands of electric bulbs are quoted at the same price. A buyer was tested a random sample of 200 bulbs of each brand and found the following information: 10M 5 3

Brand Name	Mean life (hrs)	S.D(hrs)	Size of the samples
Brand A	1300	41	10
Brand B	1280	46	15

Is there any significant difference in the mean duration of their lives of two brands of electric bulbs at 1% level of significance?

(OR)

10. Suppose the National Transportation Safety Board wants to examine the safety of cars Type A, cars Type B and cars Type C. It collects a sample of three for each of the treatments (cars types). Using the hypothetical data provided below, test whether mean pressure applied to the driver's head during crash test is equal for each types of car. 10M 5 3

cars type A	cars type B	cars type C
643	469	484
655	427	456
702	525	402

UNIT-VI

11. Marks of 11 students in two subjects A and B are given below. Obtain the rank correlation coefficient of them. 10M 6 3

Marks in subject A	25	36	20	36	48	52	25	65	35	45	60
Marks in subject B	35	42	30	42	56	68	45	50	42	55	68

(OR)

12. From the following data, compute the correlation between the heights of father and daughter by Karl Pearson's coefficient of correlation. 10M 6 3

Height of father (cm)	65	66	67	67	68	69	71	73
Height of daughter (cm)	67	68	64	69	72	70	69	73

AR18

CODE: 18BST204

SET-1

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

II B.Tech II Semester Supplementary Examinations, July, 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

UNIT-I

- 1 Show that the function $f(z) = \sqrt{|xy|}$ is not analytic at the origin even though C-R equations are satisfied thereof. 12M

(OR)

2. a) If $f(z)$ is an holomorphic function of z , show that 6M
- $$\left\{ \frac{\partial}{\partial x} |f(z)| \right\}^2 + \left\{ \frac{\partial}{\partial y} |f(z)| \right\}^2 = 4 |f'(z)|^2$$
- b) Determine the conjugate harmonic and analytic function whose real part is 6M
- $$x^3 - 3xy^2 + 3x^2 - 3y^2 + 1$$

UNIT-II

3. a) Use Cauchy's integral formula to calculate $\int_C \frac{z^2 + 1}{z(2z + 1)} dz$ Where $C: |z| = 1$ 6M
- b) If $f(k) = \int_C \frac{3z^2 + 7z + 1}{z - k} dz$ where C is the circle $|z| = 2$ find the values of (i) $f(3)$, 6M
- (ii) $f'(1-i)$ and (iii) $f''(1-i)$

(OR)

4. Expand $f(z) = \frac{1}{z^2 - 3z + 2}$ in the region a) $|z| < 1$ b) $0 < |z - 1| < 1$. 12M

UNIT-III

5. a) In a bombing action there is 50% chance that any bomb will strike the target. Two direct hits are needed to destroy the target completely. How many bombs are required to be dropped to give a 99% chance or better of completely destroying the target? 6M
- b) In a N.D. 31% of the items are under 45 and 8% are over 64. Find the mean and S.D. of the distribution. 6M

(OR)

6. Fit a Poisson's Distribution to the following data 12M

X	0	1	2	3	4	5	6	7	8
F	103	143	98	42	8	4	2	0	0

UNIT-IV

7. a) A sample of heights of 6400 persons has a mean of 65 inches. Could it be regarded as having been drawn from the population of Indians with a mean of 66 inches and a standard deviation of 7 inches? 6M
- b) A sample of 100 electric bulbs produced by manufacturer A showed a mean life time of 1190 hours and a standard deviation of 90 hours. A sample of 75 bulbs produced by manufacturer B showed a mean life time of 1230 hours with a standard deviation of 120 hours. Is there a difference between the mean life time of two brands at a significance level of 0.01? 6M

(OR)

8. a) A sample of heights of 6400 soldiers has a mean height of 67.25 inches and with a S.D of 2.56 inches. While a simple sample of heights of 1600 sailors has a mean of 68.55 inches and a S.D of 2.52 inches. Does the data indicate that the sailors are taller than the soldiers? 6M
- b) A coin was tossed 400 times and the head turned up $\frac{2}{6}$ times. Test the hypothesis that the coin is unbiased at 5% level of significance. 6M

UNIT-V

9. Fit a parabola of second degree to the following data. 12M
- x: 1.0 1.5 2.0 2.5 3.0 3.5 4.0
- y: 1.1 1.3 1.6 2.0 2.7 3.4 4.1

(OR)

10. a) Ten competitors in a beauty contest are ranked by judges in the following order. 6M

Judge1:	1	6	5	10	3	2	4	9	7	8
Judge2:	3	5	8	4	7	10	2	1	6	9
Judge3:	6	4	9	8	1	2	3	10	5	7

Use the rank correlation coefficient to discuss which pair of judges has the nearest approach to common taste in beauty.

- b) If Variance of $x = 9$, regression equations are $4x - 5y + 336 = 0$ and $20x - 9y - 107 = 0$. What were (i) the mean values of x and y (ii) the correlation coefficient of x and y (iii) The variance of y . 6M

AR18

CODE: 18EST103

SET-1

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

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

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

Time: 3 Hours

Max Marks: 60

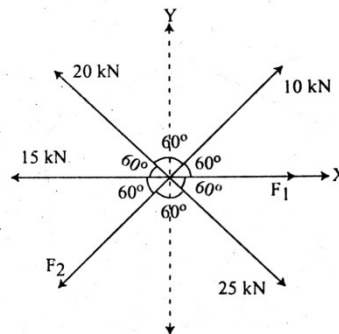
Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-I

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



- b) State and prove the lami's theorem 6M

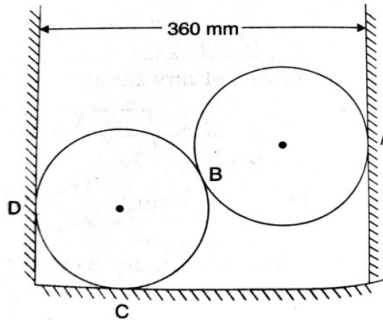
(OR)

2. a) Three forces of magnitude 40 kN, 15 kN and 20 kN are acting at a point O. the angles made by 40 kN, 15 kN and 20 kN forces with X-axis are 60° , 120° and 240° respectively. Determine the magnitude and direction of the resultant force. 6M

- b) State and prove parallelogram Law 6M

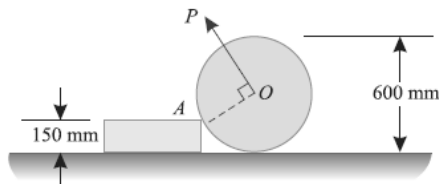
UNIT-II

3. Two smooth spheres each of radius 100mm and 12M weighing 100N, rest in a horizontal channel having vertical walls, the distance between which is 360mm. find the reactions at the points of contact A,B,C and D as shown in Fig .



(OR)

4. a) State the theorem principle of transmissibility of a force. 4M
b) A uniform wheel of 600 mm diameter, weighing 5 8M kN rests against a rigid rectangular block of 150 mm height as shown in Fig.



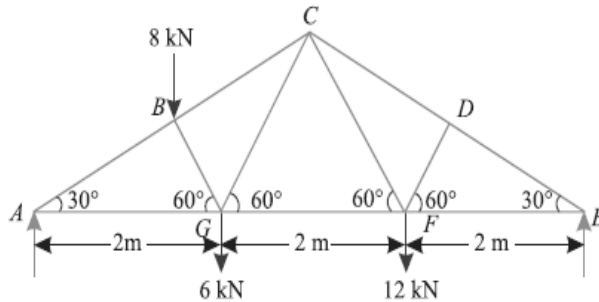
Find the least pull, through the centre of the wheel, required just to turn the wheel over the corner A of the block. Also find the reaction on the block. Take all the surfaces to be smooth.

UNIT-III

5. a) State the laws of friction and Define cone of friction 6M
b) A ladder 5 meters long rests on a horizontal ground 6M and leans against a smooth vertical wall at an angle 70° with the horizontal. The weight of the ladder is 900 N and acts at its middle. The ladder is at the point of sliding, when a man weighing 750N stands on a rung 1.5 metre from the bottom of the ladder. Calculate the coefficient of friction between the ladder and the floor.

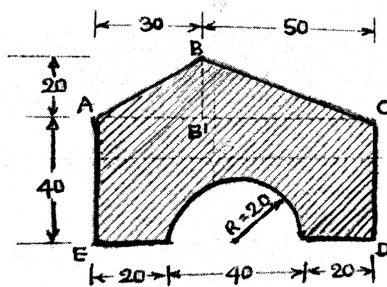
(OR)

6. An inclined truss shown in Fig is loaded. Determine the nature and magnitude of the forces in the members BC, GC and GF of the truss.



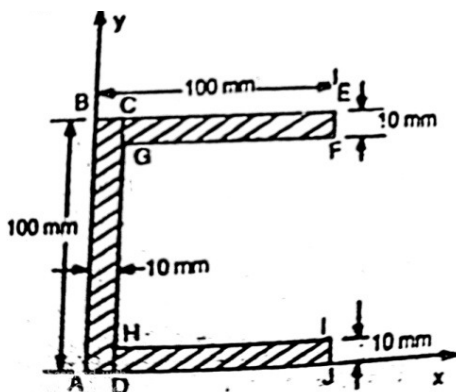
UNIT-IV

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



(OR)

8. Find the moment of inertia of the channel shown in fig with respect to the centroidal axes.



UNIT-V

9. a) A particle moving with an acceleration of 10 m/s^2 travels a distance of 50 m during the 5th second of its travel. Find its initial velocity. 6M
- b) Define the terms average acceleration, instantaneous acceleration, impulse and momentum. 6M

(OR)

10. a) State the Newton's Laws of Motion of Rotation 4M
- b) A solid cylindrical pulley of mass 800 kg, having 0.8 m radius of gyration and 2 m diameter, is rotated by an electric motor, which exerts a uniform torque of 60 kN-m. A body of mass 3t is to be lifted by a wire wrapped round the pulley. Find (i) acceleration of the body; and (ii) tension in the rope. 8M

4 of 4

AR18

CODE: 18MET204

SET-1

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

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

**STRENGTH OF MATERIALS
(Mechanical Engineering)**

Time: 3 Hours

Max Marks: 60

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-I

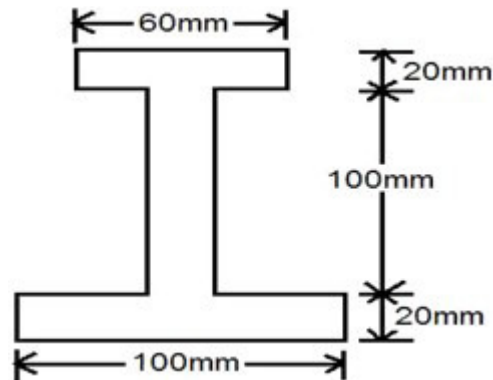
1. A straight bar 60cm long consists of three portions the first 18 cm length is of 30mm diameter, the middle 26 cm length is of 20mm dia. and the remaining 16 cm length is of 25 cm dia. If it is subjected to an axial pull of 100kN find the total extension of the bar. Find also the stresses, strains and changes in length of different portions. Take $E = 200 \text{ GPa}$ 12M
- (OR)
2. A steel rod 28 mm diameter is fixed concentrically in a brass tube of 42mm outer diameter and 30 mm inner diameter. Both the rod and tubes are 450 mm apart long. The compound rod is held between two stops which are exactly 450mm apart and the temperature of the bar is raised by 70°C . (a) Find the stresses in the rod and tube if the distance between the stops is increased by 0.30 mm. (b) Find the increase in the distance between the stops if the force exerted between them is 90kN Take $E_s=200\text{kN/mm}^2$; $\alpha_s=11.2 \times 10^{-6} \text{ per } ^\circ\text{C}$, $E_b=90\text{kN/mm}^2$; $\alpha_b = 2.1 \times 10^{-5} \text{ per } ^\circ\text{C}$ 12M

UNIT-II

3. A rectangular block of material is subjected to tensile stress of 110 N/mm^2 on one plane and a tensile stress of 47 N/mm^2 on a plane at right angles, together with shear stresses of 63 N/mm^2 on the same planes. Calculate (a) the direction and magnitude of principal stresses. (b) The magnitude of greatest shear stress. 12M
- (OR)
4. A simply supported beam of length 8m carries point loads of 4 kN and 6 kN at a distance of 2 m and 4m from the left end. Draw the S.F and B.M diagrams for the beam. 12M

UNIT-III

5. A beam of I-section shown in fig. is simply supported over a span of 4m. Determine the load that the beam can carry, if the allowable bending stress in beam is 30.82 N/mm^2 . 12M



(OR)

6. A beam of I-section is having overall depth as 500 mm and overall width as 190 mm. The thickness of flanges is 25 mm whereas the thickness of web is 15 mm. If the section carries a shear force of 40 kN, calculate the maximum shear stress. Also sketch the shear stress distribution across the section. 12M

UNIT-IV

7. A hollow shaft dia ratio $3/5$ is required to transmit 450Kw at 1200rpm, the shearing stress in the shaft must not exceed 60 N/mm^2 and the twist in a length of 2.5m is not to exceed 1° . Calculate the minimum external dia of the shaft. Take, $C=8.0 \text{ KN/mm}^2$. 12M

(OR)

8. Calculate safe compressive load on a hollow cast iron column with one end rigidly fixed and other end is hinged of 100 mm external diameter and 70 mm internal diameter and 8m in length. Use Euler's formula with a factor of safety 4. Take $E=95 \text{ kN/mm}^2$. 12M

UNIT-V

9. A steel girder of uniform section, 14 meters long, is simply supported at its ends. It carries concentrated loads of 120 kN and 80 kN at two points 3 meters and 4.5meters 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) Explain in detail the Moment Area method 6M
b) Determine the deflection at the free end of a cantilever beam point load at the free end. 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) State and explain Coulomb's law. Obtain an expression in vector form. 6M
b) Two uniform line charges of density 8nC/m are located in a plane with $y=0$ at $x=\pm 4\text{m}$. Find the Electric field at a point $P(0\text{m}, 4\text{m}, 10\text{m})$ 6M

(OR)

2. a) State Gauss's law. Using divergence theorem and Gauss's law, relate the displacement density D to the volume charge density ρ_v . 6M
b) A sphere of radius "a" is filled with a uniform charge density of ' ρ_v ' C/m^3 . Determine the electric field inside and outside the sphere. 6M

UNIT-II

3. a) Derive the expression for Amperes circuits law 6M
b) Find the magnetic field strength, H at the centre of a square conducting loop of side ' $2a$ ' in $z=0$ plane if the loop is carrying a current, I , in anti-clockwise direction. 6M

(OR)

4. a) Describe Lorentz's force equation and hence deduce the expression for the force acting on a conductor carrying a current I , when placed in magnetic field B . 6M
b) Derive equation of continuity for static magnetic fields. 6M

UNIT-III

5. Explain integral and differential form of Maxwell's four equations with word statements 12M

(OR)

6. a) Develop the boundary conditions on tangential and normal components of time varying electric field E , across the interface between two media with constants ϵ_1 and ϵ_2 . 6M
b) Write short note on Inconsistency of Ampere's Law 6M

UNIT-IV

7. a) State and prove Poynting theorem. 6M
b) Explain wave propagation in lossless medium. 6M

(OR)

8. a) Define and distinguish between the terms perpendicular polarization, parallel polarization, for the case of reflection by a perfect conductor under oblique incidence. 6M
b) Obtain an expression for the power loss in a plane conductor in terms of the surface impedance. 6M

UNIT-V

9. a) Derive the expression for input impedance of a transmission line. 6M
b) Explain about VSWR and input impedance. 6M

(OR)

10. a) Explain the principle of impedance matching with quarter wave transformer. 6M
b) Write about smith chart. How the smith charts are useful to calculate transmission line parameters? 6M

AR18

CODE: 18BST205

SET-2

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

II B.Tech II Semester Regular/Supplementary Examinations, July, 2022

**PROBABILITY AND STATISTICS WITH R
(Common to CSE & IT)**

Time: 3 Hours

Max Marks: 60

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-I

1. Two dice are thrown. Let X assign to each point (a,b) in s the maximum of its numbers. Find 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. 12 M

(OR)

2. Ships arrive in a harbour at a mean rate of two per hour ($\lambda = 2$) suppose that this situation be described by poisson distribution. Find the probability for 30 minutes period that
i) $P(X=0)$ ii) $P(X=3)$ 12 M

UNIT-II

3. a) The marks obtained in mathematics by 1000 students is normally distributed with mean 78% and S.D 11%. Determine i) how many students got marks above 90%
ii) how many students less than 10% of the students.
iii) how many students lie between 90% and 95%. 6 M

- b) If a random variable has the probability density f(x) as $f(x) = \begin{cases} 2e^{-2x} & \text{for } x > 0 \\ 0 & x \leq 0 \end{cases}$ 6 M
Find the probability that it will take on a value i) between 1 and 3 ii) greater than 0.5.

(OR)

4. Probability density function of a random variable X is 12M

$$f(x) = \begin{cases} \frac{1}{2} \sin x, & \text{for } 0 \leq x \leq \pi \\ 0, & \text{elsewhere} \end{cases}$$

find the mean, also find the probability of $p(0 < x < \pi/2)$.

UNIT-III

5. Consider the tossing of die 120 times 12 M

Faces	1	2	3	4	5	6
Observed	20	22	17	18	19	24

By comparing the observed frequencies with the expected frequencies one has to decide whether the die is fair

(OR)

6. 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 12 M
- (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

UNIT-IV

7. 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? 12 M

(OR)

8. a) A social worker believes that fewer than 25% of the couples in a certain area have never used any from the birth control. A random sample of 120 couples was contacted twenty of them said that they have used test the belief of the social worker at 0.05 level. 6 M
- b) A random sample of 400 students is found to have a mean height 171.38 cm. Can it be reasonable regarded as a sample from a large population with mean height 171.17 cm and S. D 3.30 cm test 5% level of signification? 6 M

UNIT-V

9. By the method of least squares find the straight line that best fit the following data. 12M

X	1	2	3	4	5
Y	14	27	40	55	68

(OR)

10. Calculate the two regression lines for the following data 12M

X	12	10	14	11	12	9
Y	18	7	23	19	20	15

Also calculate correlation coefficient.

AR16

CODE: 16BS2007

SET-1

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)

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

COMPLEX VARIABLES AND SPECIAL FUNCTIONS

(Electrical and Electronics 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) 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

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}_z 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. State and Explain Maxwells equations in differential form, integral form.. **14M**
- (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 $H=0.4\omega\epsilon_0 \cos(\omega t-50x) \mathbf{a}_z$ 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 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.

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 DFA to NFA. 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. Explain each component. 7 M

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
 $S \rightarrow ASB/AB,$
 $A \rightarrow a,$
 $B \rightarrow b$ 7 M

- 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
 $S \rightarrow ASA \mid aB \mid b$
 $A \rightarrow B$
 $B \rightarrow b \mid \epsilon$ 7 M

- b) Find a reduced grammar equivalent to the above grammar.
 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

AR13

CODE: 13CS2009

SET-1

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

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

FORMAL LANGUAGES AND AUTOMATA THEORY

(Common to CSE & IT)

Time: 3 Hours

Max Marks: 70

PART-A

ANSWER ALL QUESTIONS

[1 x 10 = 10 M]

1. a) What is transition diagram? How is it related to finite automata?
b) Define NFA with ϵ -moves. Give a suitable example.
c) Regular expression for all strings of a's and b's starts with ab and ends with bba is----- .
d) A language is regular if and only if-----
e) Define sentential form.
f) State Pumping Lemma on CFL.
g) Define push down automata.
h) When do you say that a string is accepted by PDA?
i) Define NP hard problem.
j) Write the transition function for Non Deterministic Turing Machine.

PART-B

Answer one question from each unit

[5x12=60M]

UNIT-I

2. a) How NFA is different from DFA? explain with example. 6M
b) Write the procedure to minimize a DFA and give an example. 6M
- (OR)
3. a) Design NFA to recognize the following set of strings: lab, cab and dab over {a,b,c,d,l}. 6M
b) Differentiate between mealy and moore machines. 6M

UNIT-II

4. a) Construct a FA equivalent to the regular expression $10 + (0 + 11)0^*1$ 10M
b) State the Arden's Theorem. 2M

(OR)

5. a) Find the RE for the following 6M
 - i set of all strings that contains exactly two a's.
 - ii.set of all strings that contains at least two a's.
 - iii. set of all strings that contains at most two a's.
- b) Define Regular set, Regular expression and Regular Language with an example. 6M

UNIT-III

6. a) Consider the grammar $S \rightarrow (L) / a$, $L \rightarrow L, S / S$. then Construct LMD, RMD and derivation trees for the following string $(a, ((a, a), (a, a)))$. 10M
b) Define Greibach Normal Form. 2M
- (OR)**
7. a) Construct CNF for the following 6M
 $E \rightarrow E + T / T$, $T \rightarrow T * F / F$, $F \rightarrow (T) / a$.
b) Explain about an ambiguous grammar with an example. 6M

UNIT-IV

8. a) Explain about the model of pushdown automata. 5M
b) Design Pushdown Automata for $L = \{ w c w^R : w \in \{a, b\}^* \}$ 7M
- (OR)**
9. a) Write procedure for conversion of PDA to CFG. 5M
b) Design PDA that accepts a string of well formed parenthesis(consider the parenthesis is as $() , \{ , \} , [,]$). 7M

UNIT-V

10. a) Explain the Chomsky hierarchy of languages 7M
b) Find whether the post correspondence problem, $P = \{(11, 11), (100, 001) (111, 11)\}$ has a match. Give the solution 5M
- (OR)**
11. Design a Turing machine that accepts $L = \{ a^n b^n c^n / n \geq 1 \}$ 12M