Model Question Paper-II with effect from 2022

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Fourth Semester B.E Degree Examination

Complex Analysis, Probability & Linear Programming (Mechanical Engg. And Allied branches)-21MATME41

TIME: 03 Hours **Max. Marks: 100**

Note: Answer any **FIVE** full questions, choosing at least **ONE** question from each module.

Q.No.		Question	M	L	CO
		Module -1			
01	a	With usual notations, derive the Cauchy-Riemann equation in the polar form	**06**	**L2**	**CO1**
	b	Find the constants a, b, c and d if $f(z) = (ax^4 + bx^2y^2 + cy^4 + dx^2 - 2y^2) + i(4x^3y - exy^3) + 4xy)$ is analytic	**07**	**L2**	**CO1**
	c	Determine the analytical function whose real part is $e^{2x}(x\cos 2y - y\sin 2y)$	**07**	**L2**	**CO1**
		OR			
02	a	Show that z^n is analytic. Hence, find its derivative	**06**	**L2**	**CO1**
	b	If f(z) is analytic function show that $\left(\frac{\partial}{\partial x}\lvert f(z)\rvert\right)^2 + \left(\frac{\partial}{\partial y}\lvert f(z)\rvert\right)^2 = \lvert f'(z)\rvert^2$	**07**	**L2**	**CO1**
	c	Find the regular function whose imaginary part is $e^x siny$	**07**	**L2**	**CO1**
		Module-2			
03	a	Discuss the transformation $w = z^2$	**06**	**L3**	**CO2**
	b	State and prove Cauchy Integral formula	**07**	**L2**	**CO2**
	c	Find the bilinear transformation which maps the points $z = 1, i, -1$ onto the points $\omega = 0, 1, \infty$	07	**L2**	**CO2**
		OR			
4	a	Evaluate $\int_c \frac{z^2-z+1}{Z-1}dx$, where C is the circle (i) $\lvert z\rvert = 1$ (ii) $\lvert z\rvert = \frac{1}{2}$	**06**	**L3**	**CO2**
	b	Discuss the transformation $w = z + \frac{1}{z}$	**07**	**L3**	**CO2**
	c	Evaluate $\oint \frac{\sin\pi z + \cos\pi z}{(z-1)(z-2)(z-3)}dz$, over the curve $\lvert z\rvert = 4$	**07**	**L3**	**CO2**
		Module-3			
5	a	A random variable X has the following probability function: x: 0 1 2 3 4 5 6 7 $P(x)$: 0 k $2k$ $2k$ $3k$ k^2 $2k^2$ $7k^2 + k$ Find the value of k and evaluate i. $P[0 < X < 5]$ ii. $P[X < 6]$ iii. $P[X > 2]$	**06**	**L2**	**CO3**
	b	Find the mean and variance of a Poisson distribution	**07**	**L2**	**CO3**

	c	If the probability that a new-born child is a male is 0.6, Using Binomial distribution find the probability in a family of 5 children i. There is no boy ii. There is at least one boy iii. There are exactly 3 boys	**07**	**L3**	**CO3**
		OR			
6	a	The p.d.f of a continuous random variable X is given by $f(x) = \begin{cases} k\,x^3 & 0 \le x \le 1 \\ 0\,, & elsewhere \end{cases}$ Find (i) The value of k (ii) $P\left[\frac{1}{3} < X < \frac{1}{2}\right]$ (iii) $Mean\ of\ X$	**06**	**L2**	**CO3**
	b	The length of a telephone conversation has an exponential distribution with a mean of 3 minutes. Find the probability that a call i. ends in less than 3 minutes ii. Takes between 3 and 5 minutes	**07**	**L3**	**CO3**
	c	In a distribution, 31% of the items are under 45 and 8% are over 64. Find the mean and standard deviation of the distribution.	**07**	**L3**	**CO3**
		Module-4			
7	a	Find an optimal solution to the following LPP by computing all possible basic solutions and then finding one that maximizes the objective function. $Maximize\ Z = 2x_1 + 3x_2 + 4x_3 + 7x_4$, subject to: $2x_1 + 3x_2 - x_3 + 4x_4 = 8$ $x_1 - 2x_2 + 6x_3 - 7x_4 = -3$ $x_1, x_2, x_3, x_4 \ge 0$	**10**	**L3**	**CO4**
	b	Using the Simplex method to solve the L.P.P $Maximize\ Z = 3x_1 + 2x_2$, subject to: $2x_1 + x_2 \le 40$ $x_1 + x_2 \le 24$ $2x_1 + 3x_2 \le 60$ $x_1, x_2 \ge 0$	**10**	**L3**	**CO4**
		OR			
8	a	Define the following terms A Linear Programming Problem, Basic solution, Basic feasible solution, Optimal solution, artificial variables of an LPP	**10**	**L3**	**CO4**
	b	Solve the LPP by the two-Phase method $Maximize\ Z = 5x_1 + 8x_2$, subject to: $3x_1 + 2x_2 \ge 3$ $x_1 + 4x_2 \ge 4$ $x_1 + x_2 \le 5$ $x_1, x_2 \ge$	**10**	**L3**	**CO4**

Module-5

9 a — Find an initial basic feasible solution by Vogel's method to the following transportation problem. **06** **L3** **CO5**

		Destination					
		A	B	C	D	E	Availability
Source	I	3	4	6	8	8	**20**
	II	2	10	1	5	30	**30**
	III	7	11	20	40	15	**15**
	IV	2	1	9	14	18	**13**
	Requirements	**40**	**6**	**8**	**18**	**6**	

b — Four jobs are to be done on four different machines. The cost (in rupees) of producing i^{th} job on the j^{th} machine is given below **07** **L3** **CO5**

		Machines			
		M_1	M_2	M_3	M_4
Jobs	J_1	15	11	13	**15**
	J_2	17	12	12	**13**
	J_3	14	15	10	**14**
	J_4	**16**	**13**	**11**	**17**

Assign the jobs to different machines so as to minimize the total cost

OR

10 a — A company has three cement factories located in cities 1, 2, 3 which supply cement to four projects located in towns 1, 2, 3 4, each plant can supply 6, 1, 10 truckloads of cement daily respectively and daily cement requirements of the projects are respectively 7, 5, 3, 2 truck loads. The transport costs per truckload of cement (in hundreds of rupees) from each plant to each project site are as follows. **10** **L3** **CO5**

	Project sites					
	1	2	3	4	
Factories	1	2	3	11	7	
	2	1	0	6	1	
	3	5	8	15	9	

Determine the optimal distribution for the company so as to minimize the total transportation cost

b — A car hire company has one car at each of five depots a, b, c, d and e. a custom R requires a car in each town, namely A,B,C,D and E. Distance (in kms) between depots and towns are given in the following distance matrix. **10** **L3** **CO5**

	a	b	c	d	e
A	160	130	175	190	200
B	135	120	130	160	175
C	140	110	155	170	185
D	50	50	80	80	110
E	55	35	70	80	105

How should cars be assigned to customers so as to minimize the distance travelled?

Bloom's Taxonomy Levels	**Lower-order thinking skills**		
	Remembering (knowledge): L_1	Understanding (Comprehension): L_2	Applying (Application): L_3
	Higher-order thinking skills		
	Analyzing (Analysis): L_4	Valuating (Evaluation): L_5	Creating (Synthesis): L_6