Model Question Paper-I with effect from 2022

USN | | | | | | | | | | |

Fourth Semester B.E Degree Examination

Complex Analysis, Probability & Linear Programming (Mechanical Engg. 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 Cartesian form	**06**	**L2**	**CO1**
	b	If f(z) is regular function of z, prove that $\left(\frac{\partial^2}{\partial x^2}+\frac{\partial^2}{\partial y^2}\right)\|f(z)\|^2 = 4\|f'(z)\|^2$	**07**	**L2**	**CO1**
	c	Determine the analytical function whose real part is $y + e^x \cos y$	**07**	**L2**	**CO1**
		OR			
02	a	If $f(z)$ is an analytic function with constant modulus, show that $f(z)$ is constant.	**06**	**L2**	**CO1**
	b	Show that $w = \log z$ is analytic everywhere except at $z = 0$ and hence find its derivative.	**07**	**L2**	**CO1**
	c	Find the analytical function whose imaginary part is $e^{-x}(\, x\, siny - y\cos y)$	**07**	**L2**	**CO1**
		Module-2			
03	a	Discuss the transformation $w = e^z$	**06**	**L3**	**CO2**
	b	State and prove the Cauchy Integral theorem	**07**	**L2**	**CO2**
	c	Find the bilinear transformation which maps the points $z = 1, i, -1$ onto the points $\omega = i, 0, -i$	07	**L2**	**CO2**
		OR			
4	a	Find the bilinear transformation which maps $1,\ i, -1\ to\ 2,\ i, -2$ respectively.	**06**	**L2**	**CO2**
	b	Verify Cauchy's theorem for the integral of z^3 over the boundary of the rectangle with vertices $z = -1,\ 1,\ 1+i,\ -1+i$	**07**	**L2**	**CO2**
	c	Evaluate $\oint \frac{e^{-z}}{(z-1)(z-2)^2} dz$, over the curve $\|z\| = 3$	**07**	**L3**	**CO2**
		Module-3			
5	a	A random variable X has the following probability function: x: -2, -1, 0, 1, 2, 3 $P(x)$: 0.1, k, 0.2, 2k, 0.3, k Find the value of k and calculate the mean and variance	**06**	**L2**	**CO3**
	b	Find the mean and standard deviation of the Binomial distribution	**07**	**L2**	**CO3**
	c	In a certain factory turning out razor blades, there is a small chance of 0.002 for any blade to be defective. The blades are supplied in packets of 20. Use Poisson distribution to calculate the approximate number of packets containing no defective, one defective and two defective blades respectively in a consignment of 500 packets	**07**	**L3**	**CO3**

		OR			
6	a	The diameter of an electric cable is assumed to be a continuous variable with p.d.f $$f(x) = \begin{cases} 6x(1-x), & 0 \le x \le 1 \\ 0, & elsewhere \end{cases}$$ Verify that the above is a valid p.d.f. Also, find its mean and variance.	**06**	**L2**	**CO3**
	b	In a test on 2000 electric bulbs, it was found that the life of a particular make was normally distributed with an average life of 2040 hours and Standard deviation of 60 hours. Estimate the number of bulbs likely to burn for i. More than 2150 hours ii. Less than 1950 hours iii. Between 1920 and 2160 hours	**07**	**L3**	**CO3**
	c	The life of a T.V tube manufactured by a company is known to have a mean of 200 months. Assuming that the life has an exponential distribution, find the probability that the life of a tube manufactured by the company is i. Less than 200 months ii. Between 100 and 300 months iii. More than 200 months	**07**	**L3**	**CO3**
		Module-4			
7	a	Using Simplex method solve the L.P.P $Maximize\ Z = 3x_1 + 2x_2$, subject to: $2x_1 + x_2 \le 5$ $x_1 + x_2 \le 3$ $x_1, x_2 \ge 0$	**10**	**L3**	**CO4**
	b	Using Big –M method , solve the LPP $Minimize\ Z = 2x_1 + x_2$, subject to: $3x_1 + x_2 = 3$ $4x_1 + 3x_2 \ge 6$ $x_1 + 2x_2 \le 3$ $x_1, x_2 \ge 0$	**10**	**L3**	**CO4**
		OR			
8	a	Explain the canonical form and standard form of an LPP. Convert the following LPP to the standard form $Maximize\ Z = 3x_1 + 5x_2 + 7x_3$, subject to: $6x_1 - 4x_2 \le 5$ $3x_1 + 2x_2 + 5x_3 \ge 11$ $4x_1 + 3x_3 \le 2$ $x_1, x_2 \ge 0$ $x_1, x_2 \ge 0$	**10**	**L3**	**CO4**
	b	Use two –Phase method to solve the LPP $Maximize\ Z = 9x_1 + 3x_2$, subject to: $4x_1 + x_2 \le 8$ $2x_1 + x_2 \le 4$ $x_1, x_2 \ge 0$	**10**	**L3**	**CO4**
		Module-5			

<table>
<tr><td>9</td><td>a</td><td>Solve the following transportation problem
<table>
<tr><td rowspan="6">Source</td><td></td><td colspan="5">Destination</td></tr>
<tr><td></td><td>A</td><td>B</td><td>C</td><td>D</td><td>Availability</td></tr>
<tr><td>I</td><td>21</td><td>16</td><td>25</td><td>13</td><td>11</td></tr>
<tr><td>II</td><td>17</td><td>18</td><td>14</td><td>23</td><td>13</td></tr>
<tr><td>III</td><td>33</td><td>27</td><td>18</td><td>41</td><td>19</td></tr>
<tr><td>Requirements</td><td>6</td><td>10</td><td>12</td><td>15</td><td>43</td></tr>
</table></td><td>10</td><td>L3</td><td>CO5</td></tr>
<tr><td></td><td>b</td><td>Solve the assignment problem
<table>
<tr><td colspan="6">Machines</td></tr>
<tr><td rowspan="5">Jobs</td><td></td><td>M_1</td><td>M_2</td><td>M_3</td><td>M_4</td></tr>
<tr><td>J_1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr>
<tr><td>J_2</td><td>4</td><td>5</td><td>6</td><td>7</td></tr>
<tr><td>J_3</td><td>7</td><td>8</td><td>9</td><td>8</td></tr>
<tr><td>J_4</td><td>3</td><td>5</td><td>8</td><td>4</td></tr>
</table>
Assign the jobs to different machines so as to minimize the total cost</td><td>10</td><td>L3</td><td>CO5</td></tr>
<tr><td colspan="6">OR</td></tr>
<tr><td>10</td><td>a</td><td>Obtain an initial basic solution to the following transportation problem
<table>
<tr><td rowspan="6">From</td><td></td><td colspan="5">To</td></tr>
<tr><td></td><td>A</td><td>B</td><td>C</td><td>D</td><td>Availability</td></tr>
<tr><td>I</td><td>11</td><td>13</td><td>17</td><td>14</td><td>250</td></tr>
<tr><td>II</td><td>16</td><td>18</td><td>14</td><td>10</td><td>300</td></tr>
<tr><td>III</td><td>21</td><td>24</td><td>13</td><td>10</td><td>400</td></tr>
<tr><td>Requirements</td><td>200</td><td>225</td><td>275</td><td>250</td><td></td></tr>
</table></td><td>10</td><td>L3</td><td>CO5</td></tr>
<tr><td></td><td>b</td><td>Five men are available to do five different jobs. From past records, the time (in hours) that each man takes to do each job is given below
<table>
<tr><td></td><td colspan="5">Jobs</td></tr>
<tr><td rowspan="5">Man</td><td></td><td>I</td><td>II</td><td>III</td><td>IV</td><td>V</td></tr>
<tr><td>A</td><td>2</td><td>9</td><td>2</td><td>7</td><td>1</td></tr>
<tr><td>B</td><td>6</td><td>8</td><td>7</td><td>6</td><td>1</td></tr>
<tr><td>C</td><td>4</td><td>6</td><td>5</td><td>3</td><td>1</td></tr>
<tr><td>D</td><td>4</td><td>2</td><td>7</td><td>3</td><td>1</td></tr>
<tr><td></td><td>E</td><td>5</td><td>3</td><td>9</td><td>5</td><td>1</td></tr>
</table>
Find the assignment of men to jobs that will minimize the total time taken</td><td>10</td><td>L3</td><td>CO5</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

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