



**SAHYADRI**  
COLLEGE OF ENGINEERING & MANAGEMENT  
An Autonomous Institution  
MANGALURU

USN

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21MAT401

**Fourth Semester B.E. Degree Examination, Sept/Oct. 2023**

**Computational Mathematics II**

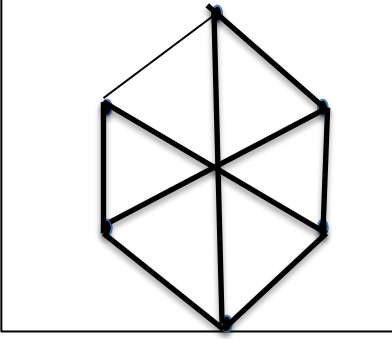
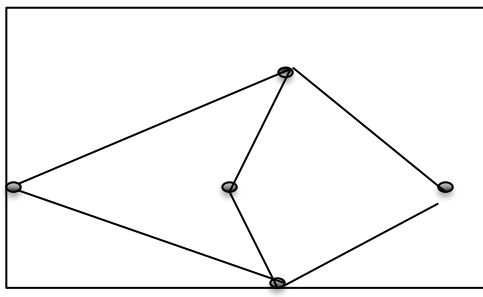
**Model Question paper**

**Time: 3 hrs.**

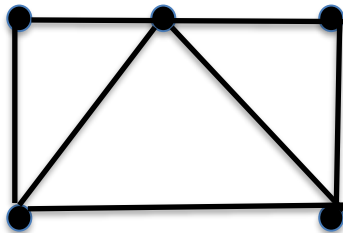
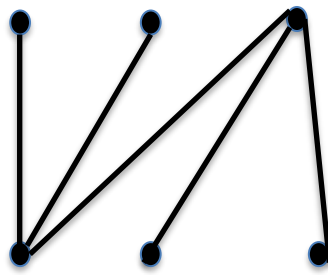
**Max. Marks: 100**

**Note: Answer any TWO full questions, choosing one full question from each part.**

MODULE -1				
Q. No		Questions	Marks	BL/CO
1	a.	Derive Cauchy -Reimann 's equation in Cartesian form	6	CL2/CO1
	b.	Show that $f(z) = \sin z$ is analytic and hence find $f'(z)$ .	7	CL3/CO1
	c.	Find the analytic function $f(z)$ given $u = e^{2x}(x \cos 2y - y \sin 2y)$ .	7	CL3/CO1
OR				
2	a.	If $f(z)$ is analytic then show that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right)  f(z) ^2 = 4 f'(z) ^2$	6	CL2/CO1
	b.	Find the regular function $f(z)$ whose imaginary part is $(r - \frac{k^2}{r}) \sin \theta$ , $r \neq 0$ hence find the real part.	7	CL3/CO1
	c.	Show that $v = \cos x \sinh y$ is harmonic and find its harmonic conjugate.	7	CL3/CO1
MODULE-2				
3	a.	i) Define a subgraph ii) Explain any three types of subgraph	6	CL3/CO2
	b.	i) Write a short note on Graph colouring. ii) Mention any two applications of graph colouring iii) Find chromatic number of the following graphs.	7	CL3/CO2

		 		
	c.	i) Explain matching of graphs. ii) Find the prefix code represented by the following tree:	7	CL3/CO2

**OR**

4	a.	i) Define the following i) Simple graph ii) Complete graph iii) Complete bipartite graph with two examples each. ii) Indicate the order and size of the following graph. <div style="display: flex; justify-content: space-around; align-items: center;">   </div>	6	CL3/CO2
	b.	Apply the merge-sort to list -9,6,5,-3,,2,-7,-5,10,-11,0,1	7	CL3/CO2
	c.	Obtain the optimal prefix code for the message ROAD IS GOOD. Indicate the code.	7	CL3/CO2

**MODULE-3**

5.	a.	The probability density function of a random variable X is $f(x) = \begin{cases} kx^2, & -3 < x < 3 \\ 0, & \text{otherwise} \end{cases}$ Find (i) the value of k (ii) $P(1 \leq x \leq 2)$ and (iii) $P(x > 1)$ .	6	CL3/CO3
	b.	In a normal distribution, 31% of the items are under 45 and 8% of the items are over 64. Find the mean and standard deviation of the distribution. (Given $\Phi(0.5) = 0.1915$ and $\Phi(1.4) = 0.4192$ )	7	CL3/CO3
	c.	A salesman sells in three cities A, B, C. He never sells in the same city on successive days. If he sells in city A on a day, then next day he sells in city B. However if he sells in either B or C, then next day he is twice likely to sell city A as in other city. In a long run how often does he sell in each of the cities?	7	CL3/CO3

**OR**

6.	a.	A manufacturer of metal pistons finds that, 12% of his pistons are rejected because they are either oversize or undersize. What is the probability that a batch of 10 pistons will contain (i) no more than 2 rejects? (ii) at least 2 rejects (iii) only 3 rejects?	6	<b>CL3/CO3</b>
	b.	Alpha particles are emitted by a radioactive source at an average of 5 emissions in 20 minutes. What is the probability that there will be i) exactly 2 emissions ii) at least 2 emissions in 20 minutes?	7	<b>CL3/CO3</b>
	c.	A fair coin is tossed thrice. The random variables X and Y are defined as follows. X= 0 or 1 according as head or tail occurs on the first toss. Y= Number of heads. a) Determine the distribution of X and Y b) Determine the joint distribution of X and Y Compute E(X),E(Y) and E(XY)	7	<b>CL3/CO3</b>

**MODULE-4**

7.	a.	Obtain 95% confidence interval for the mean $\mu$ for observed value of $\bar{X}$ of size 20 from a normal distribution with $\mu$ and $\sigma^2=80$ be 81.2.	6	<b>CL2/CO4</b>
	b.	Define the terms: i) Null hypothesis ii) Type-I and Type-II error iii) Confidence limits iv) Significance level.	7	<b>CL2/CO4</b>
	c.	A certain stimulus is administered to each of the 12 patients resulted in the following change in the blood pressure 5,3,8,-1,3,0,6,-2,1,5,0,4 . Can it be concluded that the stimulus will increase the blood pressure? (given $t_{0.05}$ for 11 d.f is 2.201)	7	<b>CL2/CO4</b>

**OR**

8.	a.	Determine 90% confidence interval for $\mu$ of a random sample of size 17 from $N(\mu, \sigma^2)$ yields $\bar{X}=4.7$ and $S^2=5.76$ .	6	CL2/CO4												
	b.	Four coins are tossed 100 times and the following results were obtained: <table><tr><td>No. of heads</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td></tr><tr><td>Frequency</td><td>5</td><td>29</td><td>36</td><td>25</td><td>5</td></tr></table> Fit a binomial distribution for the data and test the goodness of fit (Given $\chi_{0.05}^2 = 9.49$ for 4 d. f)	No. of heads	0	1	2	3	4	Frequency	5	29	36	25	5	7	CL2/CO4
No. of heads	0	1	2	3	4											
Frequency	5	29	36	25	5											
	c.	Two types of batteries are tested for their length of life and following results were obtained <table><tr><td></td><td>No. of Batteries</td><td>Mean</td><td>Variance</td></tr><tr><td>Battery A</td><td>10</td><td>500 hours</td><td>100</td></tr><tr><td>Battery B</td><td>10</td><td>560 hours</td><td>121</td></tr></table> Compute student's t and test whether there is a significant difference between two means. ( $t_{0.05}=2.086$ for 20 d.f)		No. of Batteries	Mean	Variance	Battery A	10	500 hours	100	Battery B	10	560 hours	121	7	CL2/CO4
	No. of Batteries	Mean	Variance													
Battery A	10	500 hours	100													
Battery B	10	560 hours	121													

**MODULE-5**

9.	a.	Fit a curve of the form $y = ax^b$ to the following data and hence find y when x = 8.	6	<b>CL3/CO5</b>
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		<table><tr><td>x</td><td>2</td><td>3</td><td>4</td><td>6</td><td>10</td></tr><tr><td>Y</td><td>50</td><td>47</td><td>46</td><td>45</td><td>44</td></tr></table>	x	2	3	4	6	10	Y	50	47	46	45	44																												
x	2	3	4	6	10																																					
Y	50	47	46	45	44																																					
	b.	150Fit a second-degree parabola to the following data:					7	CL3/CO5																																		
		<table><tr><td>x</td><td>1.0</td><td>1.5</td><td>2.0</td><td>2.5</td><td>3.0</td><td>3.5</td><td>4.0</td></tr><tr><td>y</td><td>1.1</td><td>1.3</td><td>1.6</td><td>2.0</td><td>2.7</td><td>3.4</td><td>4.1</td></tr></table>	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																								
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																																			
	c.	Obtain the lines of regression and hence find the coefficient of correlation for the data:					7	CL3/CO5																																		
		<table><tr><td>x</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr><tr><td>y</td><td>9</td><td>8</td><td>10</td><td>12</td><td>11</td><td>13</td><td>14</td></tr></table>	x	1	2	3	4	5	6	7	y	9	8	10	12	11	13	14																								
x	1	2	3	4	5	6	7																																			
y	9	8	10	12	11	13	14																																			
OR																																										
10	a.	A simply supported beam carries a concentrated load P at its midpoint. Corresponding to various values of P, the maximum deflection Y is measured and given below:					6	CL3/CO5																																		
		<table><tr><td>P</td><td>100</td><td>120</td><td>140</td><td>160</td><td>180</td><td>200</td></tr><tr><td>Y</td><td>0.45</td><td>0.55</td><td>0.55</td><td>0.70</td><td>0.80</td><td>0.85</td></tr></table>	P	100	120	140	160	180	200	Y	0.45	0.55	0.55	0.70	0.80	0.85	Find a best fitting straight line in the form Y=a+bP to the above data and hence estimate Y when P=																									
	P	100	120	140	160	180	200																																			
Y	0.45	0.55	0.55	0.70	0.80	0.85																																				
b.	Ten Competitors in a beauty contest are ranked by two Judges A and B in following order:					7	CL3/CO5																																			
		<table><tr><td>ID No. of Competitors</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td></tr><tr><td>Judge A</td><td>1</td><td>6</td><td>5</td><td>3</td><td>10</td><td>2</td><td>4</td><td>9</td><td>7</td><td>8</td></tr><tr><td>Judge B</td><td>6</td><td>4</td><td>9</td><td>8</td><td>1</td><td>2</td><td>3</td><td>10</td><td>5</td><td>7</td></tr></table>	ID No. of Competitors	1	2	3	4	5	6	7	8	9	10	Judge A	1	6	5	3	10	2	4	9	7	8	Judge B	6	4	9	8	1	2	3	10	5	7	Calculate Coefficient of rank Correlation						
ID No. of Competitors	1	2	3	4	5	6	7	8	9	10																																
Judge A	1	6	5	3	10	2	4	9	7	8																																
Judge B	6	4	9	8	1	2	3	10	5	7																																
	c.	. Solve the LPP using simplex method: Maximize Z=3x+5y+4z Subject to 2x+3y≤8, 2x+5z≤10, 3x+2y+4z≤15 and x, y, z≥0					7	CL3/CO5																																		

### Cognitive Levels of Bloom's Taxonomy

No.	CL1	CL2	CL3	CL4	CL5	CL6
Level	Remember	Understand	Apply	Analyze	Evaluate	Create

### Course Outcomes

<b>CO1</b>	Construct analytical functions to solve problems in electromagnetic field theory	CL3
<b>CO2</b>	Utilize basic concepts of Graph theory to develop algorithms of prefix codes.	CL3

<b>CO3</b>	Illustrate Discrete and Continuous random variables and Probability distribution functions to analyse the probability models in engineering field	CL3
<b>CO4</b>	Solve LPP and use correlation and regression analysis to fit a Mathematical model for statistical data.	CL2
<b>CO5</b>	Validate hypothesis testing and apply the Principles of Sampling to infer the nature of population.	CL3