U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

December 2023 Supplementary Examinations

Programme: B.E. **Semester: IV**
Branch: AS/ME /EEE/ECE/ET/MD/CIVIL/EIE **Duration: 3 hrs.**
Course Code: 22MA4BSCPS **Max Marks: 100**
Course: Complex Analysis, Probability and Statistical Methods

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.
3. Statistical tables are permitted.

			UNIT - I	*CO*	*PO*	Marks
1	a)	Derive C-R equations in cartesian form and hence prove that the real part of the analytic function is harmonic.		CO1	PO1	**6**
	b)	Find the analytic function $f(z) = u + iv$ whose imaginary part is $v = e^x(x\cos y - y\sin y)$.		CO1	PO1	**7**
	c)	Apply Cauchy's integral formula, evaluate $\int_C \frac{\sin \pi z^2 + \cos \pi z^2}{(z-1)^2(z-2)} dz$, where $C: \lvert z\rvert = 3$.		CO1	PO1	**7**
		OR				
2	a)	Find the analytic function $f(z) = u + iv$ when $2u + v = e^x(\cos y - \sin y)$.		CO1	PO1	**6**
	b)	If $f(z)$ is a regular function, then prove that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial x^2}\right)\lvert f(z)\rvert^2 = 4\lvert f'(z)\rvert^2$.		CO1	PO1	**7**
	c)	Verify the Cauchy's theorem for the function $f(z) = z^2$ taken over the boundary of the square having vertices $(0,0), (1,0), (1,1)$ and $(0,1)$.		CO1	PO1	**7**
		UNIT - II				
3	a)	Express the polynomial $2x^3 - x^2 - 3x + 2$ in terms of Legendre polynomials.		CO1	PO1	**6**
	b)	Obtain the series solution of Bessel's differential equation $x^2 \frac{d^2y}{dx^2} + x \frac{dy}{dx} + (x^2 - n^2)y = 0$.		CO1	PO1	**7**
	c)	Prove that $J_{1/2}(x) = \sqrt{\frac{2}{\pi x}}\sin(x)$ and $J_{-1/2}(x) = \sqrt{\frac{2}{\pi x}}\cos(x)$.		CO1	PO1	**7**

			UNIT - III			
	4	a)	Compute the Coefficient of Correlation and the equation of the lines of regression for the data: x: 1 2 3 4 5 y: 2 5 3 8 7	CO1	PO1	**6**
		b)	The participants in a contest are ranked by two judges as follows x: 1 6 5 3 10 2 4 9 7 8 y: 6 4 9 8 1 2 3 10 5 7 Compute the Rank Correlation.	CO1	PO1	**7**
		c)	Fit a least square Geometric curve $y = ax^b$ for the given data: x: 1 2 3 4 5 y: 0.5 2 4.5 8 12.5	CO2	PO1	**7**
			UNIT-IV			
	5	a)	Derive an expression for mean and variance of Poisson distribution.	CO2	PO1	**6**
		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.	CO1	PO1	**7**
		c)	A joint probability distribution is given by the following table: X \ Y: **-3** **2** **4** **1**: 0.1 0.2 0.2 **3**: 0.3 0.1 0.1 Find (i) E(X), E(Y), E (XY) (ii) σ_X and σ_Y and (iii) Cov (X, Y).	CO1	PO1	**7**
			UNIT - V			
	6	a)	A machine runs on an average of 125hours/year. A random sample of 49 machines has an annual average use of 126.9 hours with standard deviation 8.4 hrs. Does this suggest to believe that machines are used on the average more than 125 hours annually at 0.05 level of significance?	CO2	PO1	**6**
		b)	Ten individuals are chosen at random from a population and their heights in inches are found to be 63, 63, 66, 67, 68, 69, 70, 70, 71, 71. At 5% level of significance, test the hypothesis that the mean height of the universe is 66 inches.	CO2	PO1	**7**
		c)	A die was thrown 60 times and the frequency distribution for the number appearing on the face x is given by the following table: Test the goodness of fit at 5% level of significance. x: 1 2 3 4 5 6 frequency: 15 6 4 7 11 17	CO2	PO1	**7**
			OR			
	7	a)	The mean life-time of a sample of 100 fluroscent tube lights manufactured by a company is found to be 1570 hours with a standard deviation of 120 hours. At 1% level of significance, test	CO2	PO1	**6**

<table>
<tr><td></td><td></td><td></td><td>the hypothesis that the mean life -time of the lights produced by the company is 1600hours.</td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td>b)</td><td>A group of boys and girls were given an intelligence test. The mean score, standard deviation score numbers in each group are as follows.
<table><tr><td></td><td>Boys</td><td>Girls</td></tr><tr><td>Mean</td><td>74</td><td>70</td></tr><tr><td>SD</td><td>8</td><td>10</td></tr><tr><td>n</td><td>12</td><td>10</td></tr></table>Is the difference between the means of the two groups significant at 5% level of significance?</td><td>CO2</td><td>PO1</td><td>7</td></tr>
<tr><td></td><td></td><td>c)</td><td>A sample analysis of examination results of 500 students was made. It was found that 220 students had failed,170 had secured third class 90 had secured second class and 20 had secured first class. At 5% level of significance, do these figures support the general examination result which is in the ratio 4: 3:2:1 for the respective categories.</td><td>CO2</td><td>PO1</td><td>7</td></tr>
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