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

Autonomous Institute Affiliated to VTU

October 2024 Supplementary Examinations

Programme: B.E.   **Semester: IV**

Branch and Course Code: **Duration: 3 hrs.**

23MA4BSCPS (AS/ME/ECE/ET/EIE)   **Max Marks: 100**

22MA4BSCPS (AS/ME/EEE/ECE/ET/MD/CIVIL/EIE)

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. Use of Statistical tables is permitted.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

				CO	PO	Marks
			UNIT - 1			
1	a)		State and prove Cauchy-Riemann equations in Cartesian form.	1	1	6
	b)		Evaluate $\int_C |z|^2 dz$, where C is a square with the following vertices $(0,0),(1,0),(1,1),(0,1)$.	1	1	7
	c)		Discuss the transformation $w = z^2$.	1	1	7
			OR			
2	a)		Show that $v = \left(r - \frac{1}{r}\right) sin\theta$ is harmonic and find its harmonic conjugate by constructing the analytic function $f(z) = u + iv$ using Milne-Thomson method.	1	1	6
	b)		If $f(z)$ is a regular function of z, then prove that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right)|f(z)|^2 = 4|f'(z)|^2$.	1	1	7
	c)		Evaluate $\int_C \frac{e^{2z}}{(z+1)(z-2)} dz$, where C is the circle $|z| = 3$ by Cauchy's integral formula.	1	1	7
			UNIT - 2			
3	a)		If $x^3 + 2x^2 - x + 1 = aP_0(x) + bP_1(x) + cP_2(x) + dP_4(x)$ then find the values of a, b, c, d.	1	1	6
	b)		Prove that (i) $J_{-n}(x) = (-1)^n J_n(x)$ (ii) $J_n(-x) = (-1)^n J_n(x)$ where n is a positive integer.	1	1	7
	c)		Obtain the series solution of Bessel's differential equation.	1	1	7
			UNIT – 3			
4	a)		Obtain the lines of regression and the coefficient of correlation for the following data:	1	1	6
	b)		Determine the coefficient of correlation between x and y when $2\sigma_x = \sigma_y$ and the angle between the lines of regression is $\tan^{-1}\left(\frac{3}{5}\right)$.	1	1	7
	c)		The revolution (r) and time (t) are related by quadratic polynomial $r = at^2 + bt + c$. Estimate the number of revolution for time 3.5 units, given	1	1	7

Question 4a) data:

x	1	3	4	2	5	8	9
y	8	6	10	8	12	16	16

Question 4c) data:

t	1.2	1.6	1.9	2.1	2.4	2.6	3
r	5	10	15	20	25	30	35

				1	1	
5	a)	Ranks of eight students in Statistics are 1, 2, 3, 4, 5, 6, 7, 8 and in Mathematics are 2, 4, 1, 5, 3, 8, 7, 6. Find the rank correlation coefficient of the students in Statistics and Mathematics.		1	1	**6**
	b)	Fit a least squares straight line of the form $y = ax + b$ to the following data.		1	1	**7**

x	5	10	15	20	25
y	16	19	23	26	30

				1	1	
	c)	Obtain the equations of the lines of regression for the given data with the correlation coefficient of x and y as 0.8. Hence find the most probable value of y when $x = 70$.		1	1	**7**

	x-series	y-series
Mean	18	100
S.D.	14	20

UNIT - 4

				1	1	
6	a)	Derive mean and variance for the Poisson Distribution.		1	1	**6**
	b)	In a certain examination, the percentage of candidates passing and getting distinctions were 45 and 9 respectively. Estimate the average marks and standard deviation obtained by the candidates, the minimum pass and distinction marks being 40 and 75 respectively. Assume that marks are normally distributed (Given $\phi(0.13) = 0.05$ and $\phi(1.35) = 0.41$, where $\phi(z)$ is an area bounded by standard normal curve from 0 to z).		1	1	**7**
	c)	The joint probability distribution of two random variables X and Y are given as:		1	1	**7**

X \ Y	-4	2	7
1	1/8	1/4	1/8
5	1/4	1/8	1/8

Compute (i) Marginal distribution of X and Y (ii) $E(X)$ and $E(Y)$ (iii) $E(XY)$ (iv) $COV(X, Y)$.

UNIT - 5

				1	1	
7	a)	A machine runs on an average of 125 hours/year. A random sample of 49 machines has an annual average use of 126.9 hours with standard deviation 8.4 hours. Does this suggest to believe that machines are used on the average more than 125 hours annually at 0.05 level of significance?		1	1	**6**
	b)	Two types of batteries are tested for their length of life and the following results were obtained.		1	1	**7**

Battery A	$n_1 = 10$	$\bar{x}_1 = 500$ hrs	$S_1^2 = 100$
Battery B	$n_2 = 10$	$\bar{x}_2 = 200$ hrs	$S_2^2 = 121$

At 5% level of significance, test whether there is a significant difference in the two means.

				1	1	
	c)	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 1% level of significance, test whether these figures support the general examination results which is in the ratio 4:3:2:1 for the respective categories.		1	1	**7**

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