U.S.N.

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

Autonomous Institute Affiliated to VTU

September / October 2024 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)		Find the analytic function $f(z) = u + iv$ whose real part is $u = e^{2x}(x\cos 2y - y\sin 2y)$.	CO1	PO1	**6**
	b)		Discuss the tranformation $w = z^2$.	CO1	PO1	**7**
	c)		Evaluate $\oint_C |z|^2 dz$, where C is a square with the following vertices $(0,0), (1,0), (1,1)$ and $(0,1)$.	CO1	PO1	**7**
			OR			
2	a)		Show that $v = \left(r - \frac{1}{r}\right)\sin\theta$ is harmonic and hence find its analytic function.	CO1	PO1	**6**
	b)		If $f(z)$ is a regular function, then prove that $\left\{\frac{\partial}{\partial x}|f(z)|\right\}^2 + \left\{\frac{\partial}{\partial y}|f(z)|\right\}^2 = |f'(z)|^2$.	CO1	PO1	**7**
	c)		Apply Cauchy's integral formula to evaluate $\int_C \frac{e^{2z}}{(z+1)(z-2)}dz$, where C is the circle $|z| = 3$.	CO1	PO1	**7**
			UNIT - II			
3	a)		Prove that $J_n(-x) = (-1)^n J_n(x) = J_{-n}(x)$ where n is a positive integer.	CO1	PO1	**6**
	b)		If $\quad x^3 + 2x^2 - x + 1 = aP_0(x) + bP_1(x) + cP_2(x) + dP_4(x)$, find the value of a, b, c, d.	CO1	PO1	**7**
	c)		Derive the solution for Bessel's differential equation $x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} + (x^2 - n^2)y = 0$.	CO1	PO1	**7**

UNIT – III

4	a)	Obtain the lines of regression and hence find the co-efficient of correlation for the data:	CO1	PO1	**6**

x	1	3	4	2	5	8	9	10	13	15
y	8	6	10	8	12	16	16	10	32	32

	b)	Determine the co-efficient of correlation between x and y given $2\sigma_x = \sigma_y$ and the angle between the lines of regression is $\tan^{-1}\left(\frac{3}{5}\right)$.	CO1	PO1	**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 from the following data:	CO1	PO1	**7**

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

UNIT - IV

5	a)	Derive an expression for mean and variance of Poisson distribution.	CO1	PO1	**6**
	b)	A manufacturer of air-mail envelopes knows from experience that the weight of the envelopes is normally distributed with mean 1.95 gm and standard deviation 0.05 gm. About how many envelopes weighting (i) 2 gm or more (ii) 2.05 gm or less (iii) more than 2.05 but less than 1.9 can be expected in a given packet of 100 envelopes.	CO2	PO1	**7**
	c)	The joint probability distribution of two random variables X and Y are given as:	CO1	PO1	**7**

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

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

UNIT - V

6	a)	Two types of batteries are tested for their length of life and the following results were obtained.	CO2	PO1	**6**

Battery A:	$n_1 = 10$	$\bar{x}_1 = 500$ hrs	$\sigma_1^2 = 100$
Battery B:	$n_2 = 10$	$\bar{x}_2 = 500$ hrs	$\sigma_2^2 = 121$

Test whether there is a significant difference in the two means at 5% level of significance.

	b)	A random sample for 1000 workers in company has mean wage of Rs. 50 per day and S.D of Rs.15. Another sample of 1500 worker from another company has mean wage of Rs. 45 per day and S.D of Rs.20. Does the mean rate of wages vary between the two companies at 5% level of significance?	CO2	PO1	**7**

		c)	The number of accidents per day (x) as recorded in a textile industry over a period of 400 days is given below. At 5% level of significance, test the goodness of fit in respect of Poisson distribution to the given data.	CO2	PO1	**7**

x	0	1	2	3	4	5
f	173	168	37	18	3	1

OR

7	a)	A company claims that the mean thermal efficiency of diesel engines produced by them is 32.3%. to test this claim, a random sample of 40 engines were examined which showed the mean thermal efficiency of 31.4% and standard deviation of 1.6%. Can this claim be accepted or not at 1% 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 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. Do these figures support the general examination result which is in the ratio 4:3:2:1 for the respective categories at 5% level of significance?	CO2	PO1	**7**

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