K. J. Somaiya Institute of Technology, Sion, Mumbai-22 (Autonomous College Affiliated to University of Mumbai)

Nov - Dec 2023

(B.Tech) Program: Computer Engineering / IT / AI-DS Scheme II/IIB
Examination: SY/DSY Semester: III

Course Code: CEC301/ITC301/AIC301

Course Name: Applications of Mathematics in Engineering - I

Date of Exam: 29-Nov-2023

Duration: 2.5 Hours

Max. Marks: 60

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Q1	Solve any six questions out of eight:									12				
i)	Ranks of 10 students in two subjects A and B are given below.												5	Ap
	Rank in A	5	2	9	8	1	10	3	4	6	7	2		710
	Rank in B	10	5	1	3	8	6	2	7	9	4			
	Calculat	e rank	corre	lation	coeffic	cient.				artan s Barbas				
ii)	A discrete random variable has the probability density function given below. Find k and mean												6	Ap
	P(X=x)	0.2		-1 k		0 0.1	1 2k		0.1	3 2k		arlo eno		
ii)	Find $L(t e^{-t} \cosh 2t)$								2	1	Ap			
v)	Find the Fourier coefficients a_0 and b_n for $f(x) = 1 - x^2$ in (-1,1)									2	3	Ap		
V)	Show that $f(z) = e^z$ is analytic and find its derivative.									2	4	Ap		
vi)	If $f(t) = \begin{cases} t+1, 0 \le t \le 2 \\ 3, t > 2 \end{cases}$ then find $L(f'(t))$									2	1	Ap		
vii)	Find $L^{-1}\left(\frac{2s-3}{(s+1)^6}\right)$									2	2	Ap		
viii)	Fit a straight line of the form $y = a + bx$ to the following data and estimate the value of y for $x = 3.5$.												5	Ap
	X	0	0]	0	2		3		4				
	У	1.	0		.8	3	.3	4	.5	6.3		*	9 418	
2.2	Solve any four questions out of six.								16					
i)	Find the coefficient of regression b_{yx} for the following data												5	Ap
	X 5 6						9		10	11		4		, , ,
	Y	11	14	-	14	15	12		17	16			7	

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		2010	Louis Nation
Find Fourier cosine transform of $f(x) = \begin{cases} \cos x, & 0 < x < a \\ 0, & x \ge a \end{cases}$.	4	3	Ap
Find $L(sin^4t)$	4	1	Ap
Find $L^{-1}\left(\frac{2s-1}{s^2+4s+29}\right)$	4	2	Ap
Construct an analytic function whose real part is $e^x \cos y$.	4	4	Ap
In a bag there are three true coins and one false coin with head on both sides. A coin is chosen at random and tossed four times. If head occurs all the four times, what is the probability that the false coin was chosen and used?	4	6	Ap
Solve any two questions out of three.	16		
The equations of the two regression lines are $3x + 2y = 26$ and $6x + y = 31$. Find (a) the means of x and y (b) coefficient of correlation between x and y (c) If $\sigma_x = 3$ then find σ_y .	8	5	Ap
(a) Using Convolution theorem find $L^{-1}\left(\frac{1}{(s-a)(s+a)^2}\right)$ (b) Find $L^{-1}\left(\log\left(\frac{s+a}{s+b}\right)\right)$	5	2	Ap
Find the Fourier Series of $f(x) = \left[\frac{\pi - x}{2}\right]^2$. Hence prove that $\frac{\pi^4}{90} = \frac{1}{1^4} + \frac{1}{2^4} + \frac{1}{3^4} + \cdots$	8	3	Ap
Solve any two questions out of three.	16		
Show that $u = \frac{1}{2}\log(x^2 + y^2)$ satisfies Laplace equation and find its harmonic conjugate.	8	4	Ap -
Evaluate $\int_0^\infty e^{-2t} \sinh t \frac{\sin t}{t} dt$ using Laplace Transform.	8	1,2	Ap
A random variable X has the following probability function:	8	6	Ap
The state of the s	Find $L(sin^4t)$ Find $L^{-1}\left(\frac{2s-1}{s^2+4s+29}\right)$ Construct an analytic function whose real part is $e^x \cos y$. In a bag there are three true coins and one false coin with head on both sides. A coin is chosen at random and tossed four times. If head occurs all the four times, what is the probability that the false coin was chosen and used? Solve any two questions out of three. The equations of the two regression lines are $3x + 2y = 26$ and $6x + y = 31$. Find (a) the means of x and y (b) coefficient of correlation between x and y (c) If $\sigma_x = 3$ then find σ_y . (a) Using Convolution theorem find $L^{-1}\left(\frac{1}{(s-a)(s+a)^2}\right)$ (b) Find $L^{-1}\left(\log\left(\frac{s+a}{s+b}\right)\right)$ Find the Fourier Series of $f(x) = \left[\frac{\pi-x}{2}\right]^2$. Hence prove that $\frac{\pi^4}{90} = \frac{1}{1^4} + \frac{1}{2^4} + \frac{1}{3^4} + \cdots$ Solve any two questions out of three. Show that $u = \frac{1}{2}\log(x^2 + y^2)$ satisfies Laplace equation and find its harmonic conjugate. Evaluate $\int_0^\infty e^{-2t} \sinh t \frac{\sin t}{t} dt$ using Laplace Transform. A random variable X has the following probability function: $\frac{X}{P(X)} = \frac{1}{k} + \frac{1}{2} + \frac{3}{k} + \frac{4}{k} + \frac{5}{k} + \frac{6}{k} + \frac{7}{k} + \frac{7}{k}$	Find $L(\sin^4 t)$ 4 Find $L^{-1}\left(\frac{2s-1}{s^2+4s+29}\right)$ 4 Construct an analytic function whose real part is $e^x \cos y$. 4 In a bag there are three true coins and one false coin with head on both sides. 4 A coin is chosen at random and tossed four times. If head occurs all the four times, what is the probability that the false coin was chosen and used? Solve any two questions out of three. 16 The equations of the two regression lines are $3x + 2y = 26$ and $6x + y = 31$. Find (a) the means of x and y (b) coefficient of correlation between x and y (c) If $\sigma_x = 3$ then find σ_y . (a) Using Convolution theorem find $L^{-1}\left(\frac{1}{(s-a)(s+a)^2}\right)$ 5 (b) Find $L^{-1}\left(\log\left(\frac{s+a}{s+b}\right)\right)$ 3 Find the Fourier Series of $f(x) = \left[\frac{n-x}{2}\right]^2$. Hence prove that $\frac{\pi^4}{90} = \frac{1}{1^4} + \frac{1}{2^4} + \frac{1}{3^4} + \cdots$ Solve any two questions out of three. 16 Show that $u = \frac{1}{2}\log(x^2 + y^2)$ satisfies Laplace equation and find its harmonic conjugate. 8 Evaluate $\int_0^\infty e^{-2t} \sinh t \frac{\sin t}{t} dt$ using Laplace Transform. 8 A random variable X has the following probability function: 8 $\frac{X}{P(X)}$ $\frac{1}{k}$ $\frac{2}{k}$ $\frac{3}{k}$ $\frac{4}{k}$ $\frac{5}{k}$ $\frac{6}{k}$ $\frac{7}{k}$ $\frac{7}{k}$ $\frac{7}{k}$ $\frac{1}{k}$ $\frac{2}{k}$ $\frac{3}{k}$ $\frac{4}{k}$ $\frac{5}{k}$ $\frac{6}{k}$ $\frac{7}{k}$ $\frac{7}{k}$ $\frac{7}{k}$ $\frac{1}{k}$ $\frac{2}{k}$ $\frac{3}{k}$ 3	Find Pourier cosine transform of $f(x) = \{0, x \ge a\}$ Find $L(\sin^4 t)$ 4 1 Find $L^{-1}\left(\frac{2s-1}{s^2+4s+29}\right)$ 4 2 Construct an analytic function whose real part is $e^x \cos y$. 4 4 In a bag there are three true coins and one false coin with head on both sides. A coin is chosen at random and tossed four times. If head occurs all the four times, what is the probability that the false coin was chosen and used? Solve any two questions out of three. 16 The equations of the two regression lines are $3x + 2y = 26$ and $6x + y = 31$. Find (a) the means of x and y (b) coefficient of correlation between x and y (c) If $\sigma_x = 3$ then find σ_y . (a) Using Convolution theorem find $L^{-1}\left(\frac{1}{(s-a)(s+a)^2}\right)$ (b) Find $L^{-1}\left(\log\left(\frac{s+a}{s+b}\right)\right)$ 3 Find the Fourier Series of $f(x) = \left[\frac{n-x}{2}\right]^2$. Hence prove that $\frac{\pi^4}{90} = \frac{1}{1^4} + \frac{1}{2^4} + \frac{1}{3^4} + \cdots$ Solve any two questions out of three. 16 Show that $u = \frac{1}{2}\log(x^2 + y^2)$ satisfies Laplace equation and find its harmonic conjugate. Evaluate $\int_0^\infty e^{-2t} \sinh t \frac{\sin t}{t} dt$ using Laplace Transform. 8 In the foliance of the following probability function: $\frac{X}{P(X)} = \frac{1}{k} = \frac{1}{k} + \frac{1}{k} = \frac{1}{k} = \frac{1}{k} + \frac{1}{k} = \frac{1}{k} + \frac{1}{k} = \frac{1}{k} = \frac{1}{k} + \frac{1}{k} = \frac{1}{k} =$
