IT/AI.DS/COMP

DS1

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

Nov – Dec 2024-25
(B. Tech / M. Tech.) Program: Information Technology_Scheme III A2C301
Regular Examination: SY/Semester: III
Course Code: _ITC301 and Course Name : Applications of Mathematics in Engineering-1
Date of Exam: 23-12-2024 Duration: 2.5 Hours Max. Marks: 60

Instructions:
(1)All questions are compulsory.
(2)Draw neat diagrams wherever applicable.
(3)Assume suitable data, if necessary.

Q. No.	Question	Max. Marks	CO	BT level
Q 1	Solve any **two** questions out of three: (05 marks each)	10		
a)	Evaluate the integral using the Laplace transform $\int_0^\infty e^{-t}\left(\frac{cos6t-cos4t}{t}\right)dt$		1	3
b)	Obtain Fourier series of $f(x) = \|x\|$ in $(-\pi, \pi)$.		3	3
c)	1% of women at age forty who participate in routine screening have cancer. 80% of women with cancer will get positive mammographies . 9.6% of women without cancer will also get positive mammographies . A woman in this age group had a positive mammography in a routine screening , what is the probability that she actually has cancer?		6	3
Q 2	Solve any **two** questions out of three: (05 marks each)	10		
a)	Show that $u = 4xy - 3x + 2$ is a harmonic function.Find its harmonic conjugate and the corresponding function.		4	3
b)	In a contest for a search for Mr. Puerto Princesa City 2024, two judges gave their ratings to 8 candidates. Compute the coefficient of rank correlation.		5	3
c)	Find the inverse Laplace Transform of $\frac{s^2+2s+3}{(s^2+2s+5)(s^2+2s+2)}$		2	3
Q.3	Solve any **two** questions out of three. (10 marks each)	20		
a)	Find the Laplace transform of the following functions (i) cos3tcos2tcost (ii) $\int_0^t u\left(\frac{sinu}{e^u}\right)^2 du$.	5+5	1	3

Judge 1	97	96	94	89	88	87	84	84
Judge 2	93	96	97	94	91	89	88	84

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

Nov – Dec 2024-25
(B. Tech / M. Tech.) Program: Information Technology_Scheme III
Regular Examination: SY/Semester: III
Course Code: _ITC301 and Course Name : Applications of Mathematics in Engineering-1
Date of Exam: 23-12-2024 Duration: 2.5 Hours Max. Marks: 60

b)	(i) If the mean of the distribution is 16, find values m, n, variance of x, and the first four raw moments. X: 8, 12, 16, 20, 24 P(X = x): 1/8, m, n, 1/4, 1/12	5	6	3
	(ii) The daily consumption of electric power is a random variable x with probability density function $f(x) = \begin{cases} kxe^{\frac{-x}{3}} & , x > 0 \\ 0, & x \leq 0 \end{cases}$. Find the value of k, the expectation of x, and the probability that on a given day electric consumption is more than the expected value.	5	6 6	3 3
c)	(i)Find an analytic function $f(z) = u + iv$ in terms of z if $u - v = x^3 + x^2 - 3xy^2 - y^2 - 3x^2y + y^3 - 2xy$.	6	4	3
	(ii) Find the constants a,b,c,d,e if $f(z) = (ax^4 + bx^2y^2 + cy^4 + dx^2 - 2y^2) + i(4x^3y - exy^3 + 4xy)$	4	4	3
Q.4	Solve any **two** questions out of three. (10 marks each)	20		
a)	(i) Obtain the Fourier series for the function, $f(x) = \begin{cases} 1 + \frac{2x}{\pi} & , -\pi \leq x \leq 0 \\ 1 - \frac{2x}{\pi} & , 0 \leq x \leq \pi \end{cases}$ Deduce that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \frac{1}{7^2} \ldots = \frac{\pi^2}{8}$	7	3	3
	(ii) Find the fourier coefficients a_0 and a_n for the function $f(x) = x^2$ in the interval $0 \leq x \leq a$.	3		
b)	(i)Find $L^{-1}\left(\frac{s^2}{(s^2+a^2)^2}\right)$ by using convolution theorem	7	2	3
	(ii) Find the inverse Laplace Transform of $\frac{4s+12}{s^2-4s+12}$	3	2	3
c)	(i) Find the correlation coefficient between x and y ,when the lines of regression are: $2x - 9y + 6 = 0$, $x - 2y + 1 = 0$ (3marks)	3	5	4
	(ii)For 10 randomly selected observations ,the following data were observed: Overtime hrs (X): 1, 1, 2, 2, 3, 3, 4, 5, 6, 7 Additional units (Y): 2, 7, 7, 10, 8, 12, 10, 14, 11, 14 Fit a second degree curve $Y = a + bx + cx^2$.	7	5	3

****