

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

Instructions:

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

		Max. Marks	CO	BT level																						
Q 1	Solve any six questions out of eight:	12																								
i)	Ranks of 10 students in two subjects A and B are given below. <table border="1" style="margin-left: 20px; border-collapse: collapse;"> <tr> <td style="padding: 2px;">Rank in A</td> <td style="padding: 2px;">5</td> <td style="padding: 2px;">2</td> <td style="padding: 2px;">9</td> <td style="padding: 2px;">8</td> <td style="padding: 2px;">1</td> <td style="padding: 2px;">10</td> <td style="padding: 2px;">3</td> <td style="padding: 2px;">4</td> <td style="padding: 2px;">6</td> <td style="padding: 2px;">7</td> </tr> <tr> <td style="padding: 2px;">Rank in B</td> <td style="padding: 2px;">10</td> <td style="padding: 2px;">5</td> <td style="padding: 2px;">1</td> <td style="padding: 2px;">3</td> <td style="padding: 2px;">8</td> <td style="padding: 2px;">6</td> <td style="padding: 2px;">2</td> <td style="padding: 2px;">7</td> <td style="padding: 2px;">9</td> <td style="padding: 2px;">4</td> </tr> </table> Calculate rank correlation coefficient.	Rank in A	5	2	9	8	1	10	3	4	6	7	Rank in B	10	5	1	3	8	6	2	7	9	4	2	5	Ap
Rank in A	5	2	9	8	1	10	3	4	6	7																
Rank in B	10	5	1	3	8	6	2	7	9	4																
ii)	A discrete random variable has the probability density function given below. Find k and mean <table border="1" style="margin-left: 20px; border-collapse: collapse;"> <tr> <td style="padding: 2px;">X</td> <td style="padding: 2px;">-2</td> <td style="padding: 2px;">-1</td> <td style="padding: 2px;">0</td> <td style="padding: 2px;">1</td> <td style="padding: 2px;">2</td> <td style="padding: 2px;">3</td> </tr> <tr> <td style="padding: 2px;">P(X=x)</td> <td style="padding: 2px;">0.2</td> <td style="padding: 2px;">k</td> <td style="padding: 2px;">0.1</td> <td style="padding: 2px;">2k</td> <td style="padding: 2px;">0.1</td> <td style="padding: 2px;">2k</td> </tr> </table>	X	-2	-1	0	1	2	3	P(X=x)	0.2	k	0.1	2k	0.1	2k	2	6	Ap								
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iii)	Find $L(t e^{-t} \cosh 2t)$	2	1	Ap																						
iv)	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 $f(t) = \begin{cases} t + 1, & 0 \leq t \leq 2 \\ 3, & t > 2 \end{cases}$ 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 $x = 3.5$. <table border="1" style="margin-left: 20px; border-collapse: collapse;"> <tr> <td style="padding: 2px;">X</td> <td style="padding: 2px;">0</td> <td style="padding: 2px;">1</td> <td style="padding: 2px;">2</td> <td style="padding: 2px;">3</td> <td style="padding: 2px;">4</td> </tr> <tr> <td style="padding: 2px;">y</td> <td style="padding: 2px;">1.0</td> <td style="padding: 2px;">1.8</td> <td style="padding: 2px;">3.3</td> <td style="padding: 2px;">4.5</td> <td style="padding: 2px;">6.3</td> </tr> </table>	X	0	1	2	3	4	y	1.0	1.8	3.3	4.5	6.3	2	5	Ap										
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y	1.0	1.8	3.3	4.5	6.3																					
Q.2	Solve any four questions out of six.	16																								
i)	Find the coefficient of regression b_{yx} for the following data <table border="1" style="margin-left: 20px; border-collapse: collapse;"> <tr> <td style="padding: 2px;">X</td> <td style="padding: 2px;">5</td> <td style="padding: 2px;">6</td> <td style="padding: 2px;">7</td> <td style="padding: 2px;">8</td> <td style="padding: 2px;">9</td> <td style="padding: 2px;">10</td> <td style="padding: 2px;">11</td> </tr> <tr> <td style="padding: 2px;">Y</td> <td style="padding: 2px;">11</td> <td style="padding: 2px;">14</td> <td style="padding: 2px;">14</td> <td style="padding: 2px;">15</td> <td style="padding: 2px;">12</td> <td style="padding: 2px;">17</td> <td style="padding: 2px;">16</td> </tr> </table>	X	5	6	7	8	9	10	11	Y	11	14	14	15	12	17	16	4	5	Ap						
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