

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

Nov – Dec 2025

Program: B. Tech (Computer/IT/AI-DS Engineering) Scheme: III **SIB**

Regular Examination: SY Semester: III

Course Code: CEC301/ITC301/AIC301 and Course Name: Applications of Mathematics in Engineering-I

Max. Marks: 60

Date of Exam: 25/11/2025

Duration: 02.5 Hours

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)	Find the Laplace transforms of $\frac{e^{-2t} \sin 2t \cosh t}{t}$		CO1	03
b)	Find the Fourier series for $f(x) = 1 - x^2$ when $-1 \leq x \leq 1$.		CO3	03
c)	The following data regarding the heights (y) and weights (x) of 100 college students are given $\sum x = 15000, \sum x^2 = 2272500, \sum y = 6800, \sum y^2 = 463025, \sum xy = 1022250$. Find both regression coefficient and hence find coefficient of correlation between height and weight.		CO5	03
Q 2	Solve any two questions out of three: (05 marks each)	10		
a)	Find the inverse Laplace transform of $\frac{3s+1}{(s+1)(s^2+2)}$.		CO2	03
b)	Find k such that $\frac{1}{2} \log(x^2 + y^2) + i \tan^{-1} \frac{kx}{y}$ is analytic.		CO4	03
c)	In certain area 25% of women were black, 75% were white. The literacy rates for black women were 48% and for white women was 83%. If a literate women is selected at random find using Baye's theorem, the probability that she was black?		CO6	03
Q.3	Solve any two questions out of three. (10 marks each)	20		
a)	(i) Evaluate $\int_0^\infty e^{-2t} \left(\int_0^t \frac{e^{-u} \sin u}{u} du \right) dt$	7	CO1	03
	(ii) Find the Laplace transform of $\int_0^t x \cdot \cos x dx$	3		

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b)	(i) Find Fourier series of $f(x) = \begin{cases} x, & 0 \leq x \leq \pi \\ 2\pi - x, & \pi \leq x \leq 2\pi. \end{cases}$ Hence deduce $\frac{\pi^4}{96} = \frac{1}{1^4} + \frac{1}{3^4} + \frac{1}{5^4} + \dots$	7	CO3	03					
	(ii) If the Fourier transform of $f(t) = \begin{cases} 2, & -1 < t < 1 \\ 0, & \text{otherwise} \end{cases}$ is $F(\omega)$ then find $F\left(\frac{\pi}{2}\right)$	3							
c)	(i) Obtain the rank correlation coefficient from the following data. <table border="1" style="margin-left: auto; margin-right: auto;"> <tbody> <tr> <td>X :</td> <td>10, 12, 18, 18, 15, 40</td> </tr> <tr> <td>Y :</td> <td>12, 18, 25, 25, 50, 25</td> </tr> </tbody> </table>	X :	10, 12, 18, 18, 15, 40	Y :	12, 18, 25, 25, 50, 25	7	CO5	03	
	X :	10, 12, 18, 18, 15, 40							
Y :	12, 18, 25, 25, 50, 25								
(ii) If $r_{xy} = 0.4$, $\text{Cov.}(x, y) = 1.6$, $\sigma_y^2 = 25$ then find σ_x .	3								
Q.4	Solve any two questions out of three. (10 marks each)	20							
a)	(i) Find $L^{-1}\left[\frac{1}{(s^2+4s+13)^2}\right]$ using convolution theorem.	6	CO2	03					
	(ii) Find $L^{-1}\left[\log\left(1 + \frac{a^2}{s^2}\right)\right]$	4							
b)	(i) Construct an analytic function whose real part is $\frac{\sin 2x}{\cosh 2y + \cos 2x}$	6	CO4	03					
	(ii) Prove that "There does not exist an analytic function whose real part is $x^3 - 3x^2y - y^3$ "	4							
c)	(i) A continuous random variable X has the p. d. f. defined by $f(x) = A + Bx, 0 \leq x \leq 1$. If the mean of the distribution is $1/3$, find A, B.	6	CO6	03					
	(ii) A random variable X has the probability mass function <table style="margin-left: auto; margin-right: auto;"> <tbody> <tr> <td>X :</td> <td>-2</td> <td>3</td> <td>1</td> </tr> <tr> <td>$P(X = x)$:</td> <td>1/3</td> <td>1/2</td> <td>1/6</td> </tr> </tbody> </table> Find first four raw moments.	X :			-2	3	1	$P(X = x)$:	1/3
X :	-2	3	1						
$P(X = x)$:	1/3	1/2	1/6						
