S.E. / Comp / Sem - III / 'C' Scheme / Sub:- E.M-III / Date:- 10/11/25
S.H 2025
GR. Code:- 10094865

Duration: 3 hours **Max. Marks: 80**

N.B. (1) Question No. 1 is compulsory.

(2) Answer any three questions from Q.2 to Q.6.

(3) Use of Statistical Tables permitted.

(4) Figures to the right indicate full marks

Q1 A If $f(t) = (cos2t + sint)^2$, find L[f(t)] and hence find $L\{e^{-2t}f(t)\}$ **5**

B Find $L^{-1}\{\frac{1}{(s-2)(s^2+4)}\}$ **5**

C Obtain half-range sine series for f(x) = x in $0<x<2$ **5**

D Find k and moment generating function of the following distribution. Hence find mean and variance. **5**

X	1	3	4	5
P(X)	0.4k	0.1k	0.2k	0.3k

Q2 A Find the orthogonal trajectories of the family of curves $3x^2y-y^3= c$ **6**

B Find $L\{t(\frac{\cos 2t}{e^t})^2\}$ **6**

C Find the Fourier series expansion for f(x) = 1, $0 < x < 1$.
=x, $1 < x < 2$ **8**

Hence deduce that $\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \cdots$

Q3 A Find $L^{-1}\{\log(\frac{s^2+9}{\sqrt{s+8}})\}$ **6**

B Find the analytic function f(z)= u + iv where $u + v = \frac{sin2x}{cosh2y-cos2x}$, using Milne-Thompson's Method. **6**

C Fit a parabola $y = a + bx + cx^2$ for the following data: **8**

X :	1	2	3	4	5	6	7	8	9
Y :	2	6	7	8	10	11	11	10	9

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Q4 A The first 3 moments of a distribution about 2 of the random variable X are 1, 22 and 10. Compute Mean, variance and third central moment μ_3 . **6**

B Consider the equations of regression lines 4x-5y= -33 and 20x-9y - 107=0. Find $\bar{x}$, $\bar{y}$ and correlation coefficient r. **6**

C Find $L^{-1}\{\frac{(s+3)^2}{(s^2+6s+5)^2}\}$ **8**

Q5 A Show that the Laplace transform of $\frac{sin2t+sin3t}{t} = \pi - tan^{-1}(\frac{5s}{6-s^2})$. **6**

B Find Spearman's rank correlation coefficient for the data below: **6**

X :	85	74	85	50	65	78	74	60	74	90
Y :	78	91	78	58	60	72	80	55	68	70

C Obtain Fourier Series for f(x) = $\begin{cases} cosx, & -\pi < x < 0 \\ sinx, & 0 < x < \pi \end{cases}$ **8**

Q6 A If f(x) is probability density function of a continuous random variable X, find mean and variance. **6**

$f(x) = 6(x-x^2), \quad 0<x<1$

B Check if there exists an analytic function whose real part is $u= e^x(xcos2y-ysin2y)$. If so, find f(z). Justify your answer. **6**

C Evaluate the following integral by using Laplace transforms **8**

$\int_0^\infty e^{-t} [\int_0^t u^2 sinhu\ coshu\ du]\, dt$

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