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31N0506/31N0606

B. TECH. III Sem Main/Back 2025-2026
Electrical and Electronics Engineering and
Electrical Engineering
(3EX3-06/3EE3-06)
Advanced Engineering Mathematics-I
Common to EE, EX

31N0506/
31N0606

Time : 3 Hours]

[Max. Marks : 70

[Min. Passing Marks :

Instructions to Candidates :

Part-A : Short answer questions (up to 25 words) $10 * 2$ marks = 20marks.

All ten questions are compulsory.

Part-B : Analytical/Problem Solving questions $5 * 4$ marks = 20 marks.

Candidates have to answer 5 questions out of 7.

Part-C : Descriptive/Analytical/Problem Solving questions $3 * 10$ marks = 30 marks. Candidates have to answer 3 questions out of 5.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly.

Units of quantities used/calculated must be stated clearly.

Use of following supporting materials is permitted during examination.

(Mentioned in form No. 205)

1 Calculator

2 _____

Part-A

10x2=20

Q.1 Evaluate : [2]

$$\left(\frac{\Delta^2}{E}\right)x^3, \{h=1\}$$

Q.2 With usual notations, prove that : [2]

$$(E+1)\delta = 2(E-1)\mu$$

Q.3 Write Stirling's Central difference formula. [2]

Q.4 Define Milre's PC method. [2]

Q.5 Define Distribution function for a random variable. [2]

Q.6 Define continuous random variable. [2]

Q.7 A random variable X has the following probability functions : [2]

X = x :	-2	-1	0	1	2	3
P(x)	0.1	k	0.2	2k	0.3	3k

Find k.

Q.8 Find the value of E(x), where probability distributions is given as follows : [2]

X :	-2	-1	0	1
P(x)	1/6	1/2	1/4	1/12

Q.9 Classify the following PDE.

[2]

$$\frac{\partial^2 y}{\partial x^2} + \frac{\partial^2 y}{\partial x y} + \frac{\partial^2 y}{x y^2} = 0$$

Q.10 Define periodic functions and find the period of $\sin x$.

[2]

Part-B

5x4=20

Q.1 Use the method of separations of symbols to prove :

[4]

When $y = y_x$ and $0 < x < 1$.

$$y_0 + \frac{y_1 x}{[1]} + \frac{y_2 x^2}{[2]} + \dots = e^x \left[y_0 + x \Delta y_0 + \frac{x^2}{[2]} \Delta^2 y_0 + \dots \right]$$

Q.2 Find $f'(0.04)$ from the following table :

[4]

X :	0.01	0.02	0.03	0.04	0.05	0.06
f(x)	0.1023	0.1047	0.1071	0.1096	0.1122	0.1148

Q.3 Find the real root of the equation : $x^3 - 3x - 5 = 0$ corrected to four places of decimals by Newton Raphson (N-R) method.

[4]

Q.4 The incidence of occupational disease in an industry is such that the workers have a 20% chance of suffering from it. What is the probability that out of 6 workers 4 or more will suffer from disease ?

[4]

Q.5 Calculate the coefficient of correlation between x and y using the following data :

[4]

x:	1	2	3	4	5	6	7	8	9
y:	9	8	10	12	11	13	14	16	15

Q.6 Prove that : $-\pi < x < \pi$ [4]

$$\frac{x(\pi^2 - x^2)}{12} = \frac{\sin x}{1^3} - \frac{\sin 2x}{2^3} + \frac{\sin 3x}{3^3} - \dots$$

Q.7 Use Euler's modified method to solve the following equation: [4]

$$\frac{dy}{dx} = x + y \text{ given that } y(0) = 1, h = 0.2. \text{ Compute } y(1), h = 0.2$$

Part-C

3x10=30

Q.1 Using Simpson's $\frac{1}{3}$ and $\frac{3}{8}$ rule to evaluate the following : [10]

$$\int_0^1 \frac{dx}{1+x^2}$$

Hence obtain the approximate value of π in each case.

Q.2 Factorise the matrix : [10]

$$A = \begin{bmatrix} 5 & -2 & 1 \\ 7 & 1 & -5 \\ 3 & 7 & 4 \end{bmatrix}$$

into the form LU, where L and U are Lower and Upper triangular matrices respectively and hence solve the system of following equations :

$$5x - 2y + z = 4$$

$$7x + y - 5z = 8$$

$$3x + 7y + 4z = 10$$

Q.3 The first four moments of a distribution about the value 5 of the variate are 2, 0, 40 and 50. Find mean variance β_1 and β_2 . [10]

Q.4 If ϕ is the acute angle between the two regression lines in case of two variable x and y . Show that : [10]

$$\tan \theta = \frac{1 - r^2}{r} \frac{\sigma_x \sigma_y}{\sigma_{x^2} + \sigma_{y^2}}$$

where r , σ_x , σ_y have their usual meaning explain the significance of the formula when $r = 0$ and $r = \pm 1$.

Q.5 Find the Fourier series for the following function: [10]

$$f(x) = \begin{cases} -\pi & \text{for } -\pi < x < 0 \\ x & \text{for } 0 < x < \pi \end{cases}$$

Hence deduce that :

$$\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots$$
