A **Reg. No. :** | | | | | | | | | | | | |

Question Paper Code: R3M24S

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2025

Third Semester

Electrical and Electronics Engineering

R21UMA324 – PROBABILITY, STATISTICS, COMPLEX ANALYSIS AND NUMERICAL METHODS

(Regulations R2021)

(Statistical Tables can be provided)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. Small sample size is _____ CO6- U

   (a) 30 (b) >30 (c) < 30 (d) none of the above

2. The degrees of freedom for Binomial distribution is_____ CO6- U

   (a) (n -1)(n-2) (b) n -2 (c) n -3 (d) n -1

3. If A and B are mutually exclusive events then P(A∪B) = CO6- U

   (a) 0 (b)) P(A) +P(B) (a) 0 (b)) P(A) +P(B)

4. The r^{th}moment about origin is CO6- U

   (a) $\mu(X)$ (b) $\mu(X^2)$ (c) $\mu(X^r)$ (d) None of the above

5. In Newton-Raphson method the error at any stage is proportional to the --- ----- of the error in the previous stage. CO6- U

   (a) root (b) square (c) product (d) none of the above

6. Newton's method also called _____ method CO6- U

   (a) tangents (b) slope (c) secants (d) false

7. In Euler's method, if h is small, the method is too _____ CO6- U

   (a) fast (b) slow (c) average (d) None of these

8. The Fourth order Runge-Kutta methods are used widely in _____ solution to differential equations CO6- U

(a) abstract (b) graphical (c) numerical (d) None of these

9. Simple pole is a pole of order _____ CO6- U

(a) 1 (b) 2 (c) 3 (d) 4

10. The poles of z cot z is _____ CO4- App

(a) 0 (b) ± nπ (c) 1 (d) π

PART – B (5 x 2= 10 Marks)

11. A sample of size 10 has mean 58, standard deviation18.4 and population mean 50, Compute the calculated value of 't' distribution. CO1-App

12. A discrete random variable X with probability distribution CO2-App

X	0	1	2	3	4	5
P(X)	a	3a	5a	7a	9a	11a

Using the probability mass function, Calculate the value of the constant ' a ' and mean value.

13. Write the condition of convergence of Newton's method CO6 -U

14. Using Taylor series method find y(0.1) given $\frac{dy}{dx}$ =1+ y, y(0) =0 CO4 - App

15. Evaluate $\int_c \frac{e^{-z}}{z+1} dz$ where C is $|z| = \frac{1}{2}$ using Cauchy integral formula CO5-App

PART – C (5 x 16= 80Marks)

16. (a) (i) The following results are obtained from a sample of 10 boxes of biscuits. Mean weight content 490gm, standard deviation of the weight 9gm. Could the sample come from a population having a mean of 500gm ? CO1- Ana (8)

(ii) 1000 students at college level were graded according to their I.Q. and their economic conditions. Identify the distribution what conditions can you draw from the following data? CO1- Ana (8)

Economic conditions	I.Q. level		
	High	Low	Total
Rich	460	140	600
Poor	240	160	400
Total	700	300	1000

Or

(b) (i) On the basis of information noted below, find out whether the new treatment is comparatively superior to the conventional one. Identify the sampling distribution. CO1-Ana (8)

	Favorable	Non-Favorable	Total
conventional	40	70	110
New	60	30	90
Total	100	100	200

(ii) The following are the average weekly losses of working hours due to accidents in 10 industrial plants before and after an instruction of a safely program was in two operation. CO1- Ana (8)

Before	45	73	46	104	33	57	83	34	26	17
After	36	60	44	119	35	51	77	29	24	11

Use to 0.05 level of significance to test whether the safely is effective.

17. (a) A Random Variable X has the following probability distribution CO2-App (16)

X=x	0	1	2	3	4	5	6	7	8
P(X=x)	a	3a	5a	7a	9a	11a	13a	15a	17a

Find

i) 'a'

ii) p(x<3)

iii) p(0<x<3)

iv) $p(x \geq 3)$

v) Find the Distribution function of X

Or

(b) (i) State and Prove the memory less property for an Exponential distribution. CO2-App (8)

(ii) Two random variables X & Y have the joint density CO2-App (8)

$$f(x,y) = \begin{cases} 2 - x - y, & 0 < x < 1, \quad 0 < y < 1 \\ 0 & otherwise \end{cases}$$

Show that Cov (X,Y) = $\frac{-1}{144}$. Also find the correlation coefficient.

18. (a) (i) Solve $27x + 6y - z = 85$, $6x + 15y + 2z = 72$, $x + y + 54z = 110$ by Gauss Seidel method — CO2-App — (8)

(ii) Using Power method find numerically largest Eigen value of — CO3–App — (8)

$$A = \begin{bmatrix} 1 & -3 & 2 \\ 4 & 4 & -1 \\ 6 & 3 & 5 \end{bmatrix}$$

Or

(b) Solve for a positive root of $x \log_{10} x - 1.2 = 0$ by Newton's Raphson method. — CO3- App — (16)

19. (a) Using R.K Method of 4th order, solve $\frac{dy}{dx} = x + y^2$ with $y(0) = 1$ at $x = 0.1$, $x = 0.2$ — CO4- App — (16)

Or

(b) Given — CO4-App — (16)

$$\frac{dy}{dx} = \frac{1}{2}(xy),\ y(0) = 1,\ y(0.1) = 1.01,\ \ y(0.2) = 1.022,\ \ y(0.3) = 1.023$$

Find $y(0.4)$ by Milne's Predictor & Corrector method.

20. (a) Evaluate — CO5-App — (16)

$$f(z) = \int_C \frac{\cos \pi z^2 + \sin \pi z^2}{(z-1)(z-2)} dz$$ by using Cauchy Integral formula

where C is $|z| = 3$

Or

(b) (i) Evaluate using Cauchy's Residue theorem for — CO5- App — (8)

$f(z) = \int_C \frac{3z^2 + z - 1}{(z^2 - 1)(z - 3)} dz$, where 'C' is the circle $|z| = 2$.

(ii) Evaluate — CO5- App — (8)

$f(z) = \frac{1}{(z+1)(z+3)}$ in Laurent series valid for the region

$1 < |z| < 3$.