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Question Paper Code :R3M24

B.E./B.Tech. DEGREE EXAMINATION, APRIL / MAY 2025

Third Semester

Electrical And Electronics Engineering

R21UMA324-PROBABILITY, STATISTICS, COMPLEX ANALYSIS AND NUMERICAL METHODS

(Regulations R2021)

Duration: Three hours

Maximum: 100 Marks

PART A - (10 x 1 = 10 Marks)

1. Large sample size is _____
(a) 30 (b) >30 (c) < 30 (d) none of the above
CO6-U
2. Choose the F-test statistic is
(a) $F = S_1^2 / S_2^2$ if $S_1^2 < S_2^2$ (b) $F = S_2^2 / S_1^2$ if $S_2^2 > S_1^2$ (c) $F = 0$ (d) None of the above
CO6-U
3. If A and B are mutually exclusive events then $P(A \cup B) =$
(a) 0 (b) $P(A) + P(B)$ (c) $P(A) \cdot P(B)$ (d) $P(A) - P(B)$
CO6-U
4. If X and Y are independent random variables then
(a) $f(x,y) = f(x) \cdot f(y)$ (b) $f(x,y) = f(x) + f(y)$ (c) $f(x,y) = f(x) - f(y)$ (d) None of the above
CO6-U
5. For any root the order of convergence of Newton's method is _____
(a) 4 (b) 1 (c) 2 (d) 3
CO6-U
6. Gauss Seidel method converges faster than _____
(a) Gauss Elimination (b) Gauss Jacobi (c) Gauss Jordan (d) Newton's
CO6-U
7. In Euler's method, if h is small, the method is too _____
(a) fast (b) slow (c) average (d) None of these
CO6-U
8. Predictor-Corrector methods are _____ starting methods
(a) self (b) not self (c) identity (d) None of these
CO6-U
9. Simple pole is a pole of order _____
(a) 1 (b) 2 (c) 3 (d) 4
CO6-U

10. The value of $\int_c \frac{dz}{z^2} = 0$ where C is _____

CO5-App

(a) $|z| = 1$

(b) $|z - 1| = 2$

(c) $|z| = 2$

(d) $|z - 2| = 1$

PART – B (5 x 2= 10Marks)

11. If $S_1^2 = 13.33$ and $S_2^2 = 28.55$ then compute the value of F- ratio.

CO1-App

12. Using Probability mass function, Compute the mean value for the following CO2-App distribution.

X	-2	-1	0	1
P(X)	0.4	0.1	0.2	0.3

13.

CO6-U

State Newton's Iterative formula

14. Using Euler's method find $y(0.1)$ given $\frac{dy}{dx} = 1 + y^2$, $y(0) = 0$

CO4-App

15. Evaluate $\int_c \frac{z}{z-2} dz$ where C is $|z| = 2$

CO5-App

PART – C (5 x 16= 80Marks)

16. (a) (i) Two researchers A and B adopted different techniques while rating the student's level. Identify the Sampling distribution; Can you say that the techniques adopted by them are significant? CO1-Ana (8)

Researchers	Below Average	Average	Above Average	Genius	Total
A	40	33	25	2	100
B	86	60	44	10	200
Total	126	93	69	12	300

(ii) Two horses A and B were tested according to time (in seconds) to run on a particular track with the following results: CO1-Ana (8)

Horse A	28	30	32	33	33	29	34
Horse B	29	30	30	24	27	29	

Identify the sampling distribution, test whether Horse A is running faster than B at 5% level.

Or

- (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)
- (b)

	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
$P(X=x)$	0	k	$2k$	$2k$	$3k$	k^2	$2k^2$	$7k^2 + k$

Findi) 'k'

ii) $P(X < 6)$, $P(X \geq 6)$ & $P(1.5 < X < 4.5 / X > 2)$

iii) If $P(X \leq k) > \frac{1}{2}$ find the minimum value of 'k'

iv) Distribution function of x v) $E(X)$

Or

- (b) (i) probability distribution function of a random variable X is CO2-App (8)

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

Find the cumulative distribution function of X .

- (ii) Using the probability mass function of Binomial distribution, CO2-App (8)
Compute the moment generating function and hence find mean and variance

18. (a) (i) Solve for a positive root of $x \log_{10} x - 1.2 = 0$ by Newton's Raphson method CO3-App (8)

(ii) Solve $27x + 6y - z = 85$, $6x + 15y + 2z = 72$, $x + y + 54z = 110$ by Gauss Jacobi method CO3-App (8)

Or

(b) (i) Using Power method find numerically largest Eigen value of

$$\begin{pmatrix} 1 & 6 & 1 \\ 1 & 2 & 0 \\ 0 & 0 & 3 \end{pmatrix}$$
 CO3-App (8)

(ii) Solve $27x + 6y - z = 85$, $6x + 15y + 2z = 72$, $x + y + 54z = 110$ by Gauss Seidel method CO3-App (8)

19. (a) (i) Using Taylor's series method find $y(1.1)$ given $y' = x + y$ with $y(1) = 0$ CO4-App (8)

(ii) Given $\frac{dy}{dx} = \frac{y-x}{y+x}$ with $y(0) = 1$, find y for $x = 0.1$ by Euler's Method CO4-App (8)

Or

(b) (i) Given $\frac{dy}{dx} = 1 + y^2$, $y(0) = 0$, $y(0.2) = 0.2027$, $y(0.4) = 0.4228$, $y(0.6) = 0.6841$ evaluate $y(0.8)$ By Adams – Bash forth Method CO4-App (8)

(ii) Using R-K method of fourth order, solve $\frac{dy}{dx} = x^3 + y$ with $y(0) = 2$ at $x = 0.2$, $x = 0.4$ CO4-App (8)

20. (a) (i) Evaluate using Cauchy's Residue theorem for CO5-App (8)

$$f(z) = \int_C \frac{\cos \pi z^2 + \sin \pi z^2}{(z+1)(z+2)} dz, \text{ where 'C' is } |z| = 3$$

(ii) Evaluate $f(z) = \frac{z}{(z+1)(z+3)}$ in Laurent's series valid for the region $1 < |z| < 3$. CO5-App (8)

Or

(b) Using Contour integration, to prove $\int_{-\infty}^{\infty} \frac{x^2}{(x^2 + a^2)(x^2 + b^2)} dx = \frac{\pi}{a+b}$ $a > b > 0$ CO5-App (16)