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Question Paper Code: U3024

B.E./B.Tech. DEGREE EXAMINATION, NOV 2023

Third Semester

Electrical and Electronics Engineering

21UMA324- PROBABILITY, STATISTICS, COMPLEX ANALYSIS AND NUMERICAL METHODS

(Regulations 2021)

(t,f,x2 table has to be given)

Duration: Three hours

Maximum: 100 Marks

Answer All Questions

PART A - (10x 1 = 10 Marks)

1. Large sample size is _____ CO6- U
(a) 30 (b) >30 (c) < 30 (d) none of the above
2. The degrees of freedom for the sample size $n=25$ in t test is _____. CO6 -U
(a) 20 (b) 22 (c) 24 (d) 26
3. If X and Y are independent random variables then CO6- U
(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
4. ----- discrete distribution has equal mean and variance CO6 -U
(a) Binomial (b) Poisson (c) Geometric (d) Exponential
5. When Gauss Jordan method is used to solve $AX=B$, A is transferred in a CO6 -U
_____ matrix.
(a) diagonal (b) identity (c) none (d) zero
6. For any root the order of convergence of Newton's method is _____ CO6- U
(a) 4 (b) 1 (c) 3 (d) None of the above
7. Taylor Series method will be very useful to give some _____ values for RK, CO6- U
Milne's and Adam's methods
(a) initial (b) final (c) One (d) two

8. _____ prior values are required to predict the next value in Milne's method CO6- U
 (a) 1 (b) 2 (c) 3 (d) 4
9. The value of $\int_c \frac{dz}{z+2}$, $c: |z| = 1$ is _____ CO4- App
 (a) $2\pi i$ (b) $-2\pi i$ (c) $4i$ (d) 0
10. Find the poles of $f(z) = \frac{z^2 + 1}{1 - z^2}$ CO4- App
 (a) 1, 0 (b) 1, -1 (c) 1, 0 (d) 0, 0

PART – B (5 x 2= 10Marks)

11. A sample of size 10 has mean 58, standard deviation 18.4 and population mean 50, Compute the calculated value of 't' distribution. CO1- App
12. A Continuous random variable with density function is given by $f(x) = 6x(1-x)$, $0 \leq x \leq 1$ Check the above is PDF or not. CO2- App
13. State the principle used in Gauss Elimination Method CO6- U
14. Which method is better? Taylor's series or RK method. Why? CO6- U
15. Find the Residues of $f(z) = \frac{z+1}{z(z-2)}$ 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

Table value is 7.815

- (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. Table value is 2.201

Or

- (b) (i) A company keeps records of accidents. During a recent safety review, a random sample of 60 accidents was selected and classified by the day of the week on which they occurred. Table value is 9.458

Days	Mon	Tue	Wed	Thu	Fri
No.of. accidents	8	12	9	14	17

- (ii) Two independent samples of sizes 9 and 7 from a normal population had the following values of the variables.

Sample I	18	13	12	15	12	14	16	14	15
Sample II	16	19	13	16	18	13	15		

Identify the sampling distribution, Do the estimates of the population variance differ significantly. Table value is 3.58.

17. (a) A Random Variable X has the following probability distribution

$X=x$	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 $P(X < k) > 1/2$ find the minimum value of 'k'
Or

- (b) (i) Using the probability mass function of Poisson distribution, Compute the moment generating function and hence find mean and variance.

(ii) The joint pdf of (X, Y) is given by $f(x, y) = e^{-(x+y)}$, $0 < x, y < \infty$. Are X & Y are independent?

18. (a) (i) Solve for a positive root of $3x - \cos x - 1 = 0$ by Newton's Raphson method.

(ii) Solve $4x + 2y + z = 14$, $x + 5y - z = 10$, $x + y + 8z = 20$ by Gauss Elimination method

Or

- (b) (i) Using Power method find numerically largest Eigen value of $\begin{pmatrix} 25 & 1 & 2 \\ 1 & 3 & 0 \\ 2 & 0 & -4 \end{pmatrix}$ CO3- App (8)
- (ii) Solve $28x+4y-z = 32$; $x+3y+10z = 24$; $2x+17y+4z = 35$ 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) 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)
20. (a) (i) Evaluate $f(z) = \int_C \frac{\cos \pi z^2 + \sin \pi z^2}{(z+1)(z+2)} dz$ by using Cauchy's Integral formula where C is $|z| = 3$ CO5- App (8)
- (ii) Expand $\frac{z-1}{(z+2)(z+3)}$ as Laurent's series valid in the region $2 < |z| < 3$ 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)