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Paper Code : MM-301

PUID : 03152 (To be mentioned in the main answer script)

STATISTICS AND NUMERICAL TECHNIQUES

Time Allotted : 3 Hours | *Full Marks* : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any ten of the following : $10 \times 1 = 10$

   i) Which of the following is not a measure of central tendency ?

   a) Mean

   b) Median

   c) Mode

   d) Average deviation.

ii) The percentage error in approximate 1/3 to .3333 is

a) 0.06% b) 0.006%

c) 0.6% d) none of these.

iii) The range of the daily wages of 6 persons given by 18, 25, 15, 20, 28, 22 is

a) 10 b) 12

c) 9 d) 13.

iv) Lagrange's interpolation formula is used for

a) equispaced arguments only

b) unequispaced arguments only

c) both equispaced and unequi spaced arguments

d) none of these.

v) The rate of convergence of N-R method is

a) linear b) quadratic

c) cubic d) none of these.

vi) If A and B are independent event then $\overline{A}$ and $\overline{B}$ are independent.

a) True b) False.

vii) Which of the following is not true (the notation have their usual meaning) ?

a) $\Delta = E - 1$ b) $\Delta.\nabla = \Delta - \nabla$

c) $\frac{\Delta}{\nabla} = \Delta - \nabla$ d) None of these.

viii) IF P (A) = 1/2, P(B) = 1/3, P(AB) = 1/4, P(A+B) is

a) $\frac{7}{12}$ b) $\frac{5}{12}$

c) $\frac{9}{12}$ d) None of these.

ix) Two dice are thrown, the probability getting seven point is

a) $\frac{1}{6}$ b) $\frac{2}{6}$

c) $\frac{7}{36}$ d) None of these.

x) The convergence condition for Gauss-Seidel iterative method for solving a system of linear equation is

a) the coefficient matrix is singular

b) the coefficient matrix has rank zero

c) the coefficient matrix must be strictly diagonally dominant

d) none of these.

xi) The local truncation error of Eular method for solving $\frac{dy}{dx} = f(x, y)$ with $y(x_0) = y_0$ is

a) $O(h^2)$ b) $O(h^3)$

c) $O(h^4)$ d) $O(h^5)$.

xii) $P(A + B) = P(A) + P(B)$, then A and B are

a) independent b) mutually exclusive

c) can't be decided d) none of these.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. i) If $y = 4x^6 - 5x$, find the relative percentage error in y at $x = 1$, if the error in $x = 0.04$.

ii) Round-off the following numbers correct up to 4-significant figures : 2.56235, 2456.782

3. Write down the polynomial (interpolation formula) of degree three relevant to the data :

X	–1	0	1	2
$f(x)$	1	1	1	–5

4. Find the mean and median for the following data :

Weight in Kg	36-40	41-45	46-50	51-55	56-60	61-65	66-70
No. of Persons	14	26	40	53	50	37	25

5. Let A, B, C be three mutually independent events. Prove that A and B + C are mutually independent. Prove also that $\overline{A}$ and $\overline{BC}$ are also independent.

6. Evaluate $\int_0^1 (4x - 3x^2)\,dx$, *taking* 10 *intervals, by* Simpson's one – third rule. Compute the exact value and find the absolute and relative errors in your result.

$\frac{h}{3}$ (sum of 1st & last + 4 × sum of odd + 2 × sum of even)

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. a) Establish the Newton's backward interpolation formula.

   b) Prove that sum of the coefficient of the Lagrangian Function is unity

8. a) An urn contains 8 white balls and 3 red balls. If two balls are drawn at random, find the probability that : i) both are white ii) both are red.

   b) Use Runge-Kutta Method of forth order to compute the numerical values of the differential equation $\frac{dy}{dx} = xy$; $y(0) = 2$, find y at $x = 0.8$ taking $h = 0.2$.

9. a) Derive the Newton-Raphson Method. Using this formula to find the roots of the equation $x^2 - 5x + 2 = 0$ correct up to three places of decimals.

b) Two urns contain respectively 5 white, 7 black balls, and 4 white and 2 black balls. One of the urns is selected by the toss of a fair coin and then 2 balls are drawn without replacement from the selected urn. If both balls drawn are white, what is the probability that the first urn is selected ?

10. a) The chance that a doctor will diagnose a certain disase correctly is 60%. The chance that a patient will die by his treatment after correct diagnosis is 40% and the chance of death by wrong diagnosis is 70%. A patient of the doctor who had the disease dies. What is the probability that the disease was diagnosed correctly ?

b) A random variable X has the following probability mass function

X	0	1	2	3	4	5	6	7
P(X=k)=f(x)	0	k	2k	2k	3k	k^2	$2k^2$	$7k^2+k$

i) Find k.

ii) Obtain the distribution function F(x).

11. a) Find the least square line $y = a + bx$ for the following data :

x	–2	0	2	4	6
y	1	3	6	8	13

b) Solve the following system of linear equations by Gauss-Elimination method

$$5x - y + z = 10$$
$$2x + 4y = 12$$
$$x + y + 5z = -1$$

c) Compute one root of $e^x - 3x = 0$, correct to 3 decimal places by any suitable method. 5 + 5 + 5