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Reg. No. :

Z 3508

M.C.A. DEGREE EXAMINATION, MAY/JUNE 2008.

Elective

MC 1621 — NUMERICAL AND STATISTICAL METHODS

(Regulation 2005)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Write down the differences between Gauss elimination and Gauss Jordan elimination methods.

2. State the condition for convergence of Gauss-Seidal method.

3. Write the Lagrange's interpolation formula for unequal intervals.

4. State the difference formula to find the first order derivative using backward differences.

5. Name any two single step and multi step methods in solving a differential equation numerically.

6. Write down the Adam's predictor-Corrector formula.

7. If the events A and B are independent, then prove that the events $\bar{A}$ and B are also independent.

8. A bag contains 8 white balls and 10 black balls. Two balls are drawn in succession. What is the probability that first is white and the second is black?

9. Define Type I error and Type II error in the test of hypothesis.

10. The mean lifetime of a sample of 25 bulbs is found to be 1550 hours with a S.D. of 120 hours. The company manufacturing the bulbs claims that the average life of their bulbs is 1600 hours. Is the claim acceptable at 5% level of significance?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Solve the following equations by Gauss elimination method :

$x + y + z = 1; 3x + y + z = 5; x - 2y - 5z = 25$.

(ii) By Gauss-Jordan method, solve the following equations :

$3x - y + 2z = 12; x + 2y + 3z = 11; 2x - 2y - z = 2$.

Or

(b) Solve by Gauss-Jacobi iterative method, the following equations :

$8x - 3y + 2z = 20; 6x + 3y + 12z = 35; 4x + 11y - z = 33$

12. (a) (i) The population of a town in the census is given below. Estimate the population in the year 1895 and 1925.

Year	1891	1901	1911	1921	1931
Population (in lakhs)	46	66	81	93	101

(ii) Use Lagrange's interpolation formula to find f(5), given the following data :

x	1	2	3	4	7
f(x)	2	4	8	16	128

Or

(b) (i) Find the first and second derivative at x = 1.5 of the function tabulated below :

X	1.5	2.0	2.5	3.0	3.5	4.0
Y	3.375	7.0	13.625	24.0	38.875	59.0

(ii) Evaluate $\int_0^{\pi} \sin x dx$, taking $h = \pi/6$ by Trapezoidal method and Simpson's 1/3 method and verify your answer by integration.

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14.

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13. (a) (i) Use Tailor series method to find y at x=0.1, 0.2 given $\frac{dy}{dx} = 3e^{X} + 2y, y(0) = 0$.

(ii) Apply fourth order Runge-Kutta method and find $y(0.1)$ given that $\frac{dy}{dx} = \frac{1}{2}(1+x)y^2$, $y(0) = 1$.

Or

(b) Given $\frac{dy}{dx} = xy + y^2, y(0) = 1$, find $y(0.1), y(0.2), y(0.3)$ by Tailor series method and find $y(0.4)$ and $y(0.5)$ by Milne's method.

14. (a) (i) A bag contains 5 balls and it is not known how many of them are white. Two balls are drawn at random from the bag and they are noted to be white. What is the chance that all the balls in the bag are white?

(ii) A continuous random variable X has the probability density function $f(x) = k\, x^2 e^{-x}$, $x > 0$. Find k, mean and variance.

Or

(b) Consider a discrete random variable X having probability density function $f(x) = \begin{cases} \frac{1}{x(x+1)}, & x = 1, 2, \cdots \\ 0, & otherwise \end{cases}$, show that E(X) does not exist even though M.G.F. exist.

15. (a) (i) Two independent samples of sizes 8 and 7 contained the following values. Is the difference between sample means significant.

Sample I	19	17	15	21	16	18	16	14
Sample II	15	14	15	19	15	18	16	

(ii) Two samples of sizes 9 and 8 gave the sums of squares of deviations from their respective means equal to 160 and 91 respectively. Can they be regarded as drawn from the same normal population.

Or

(b) Fit a Poisson distribution for the following distribution and also test the goodness of fit :

x	0	1	2	3	4	5	Total
f	142	156	69	27	5	1	400