Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 80771

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2021.

Fourth Semester

Mechanical Engineering

MA 2266/MA 1254/10177 SN 401/080120014/MA 42 – STATISTICS AND NUMERICAL METHODS

(Regulations 2008/2010)

Time : Three hours Maximum : 100 marks

Statistical tables may be permitted.

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define Type I and Type II errors.

2. Give two uses of Chi-square distribution.

3. State the basic principles of design of Experiments.

4. Define : RBD.

5. Compare Gauss-Jordan method with Gauss-Seidal method.

6. Write the formula and order of convergence for Newton-Raphson method.

7. Use Lagrange's formula to fit a polynomial to the data and find y at $x = 1$.

X:	–1	0	2	3
Y:	–8	3	1	12

8. Show that the divided difference of second order can be expressed as the quotient of two determinants of third order.

9. Using Taylor's method, find y at $x = 1.1$ given $\frac{dy}{dx} = x^3 + y,\ y(1) = 1$.

10. Obtain the finite difference scheme for differential equation $2\frac{d^2y}{dx^2} + y = 5$.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Random samples drawn from two countries gave the following data relating to the heights of adult males. Is the difference between standard deviation significant? (8)

	Country A	Country B
Mean height (in inches)	67.42	67.25
S.D (in inches)	2.58	2.50
Number in samples	1000	1200

(ii) 1000 students at college level were graded according to their I.Q. and their economic conditions. What conclusion can you draw from the following data (8)

Economic conditions	I.Q. Level	
	High	Low
Rich	460	140
Poor	240	160

Or

(b) (i) The sales manager of a large company conducted a sample survey in states A and B taking 400 samples in each case. The results were in the following table. Test whether the average sales in the same in the 2 states at 1% level. (8)

	State A	State B
Average sales	Rs. 2,500	Rs. 2,200
S.D.	Rs. 400	Rs. 550

(ii) Find if there is any association between extravagance in fathers and extravagance in sons from the following data. Determine the coefficient of association also (8)

	Extravagant father	Miserly father
Extrav. Sons	Under 327	741
Miser. Sons	545	234

12. (a) Analyse the following RBD and find your conclusion. (16)

		Treatments			
		T_1	T_2	T_3	T_4
	B_1	12	14	20	22
	B_2	17	27	19	15
Blocks	B_3	15	14	17	12
	B_4	18	16	22	12
	B5	19	15	20	14

Or

(b) The following is a Latin square of a design when 4 varieties of seed are being tested. Set up the analysis of variance table and state your conclusion. You can carry out the suitable charge of origin and scale. (16)

A 110	B 100	C 130	D 120
C 120	D 130	A 110	B 110
D 120	C 100	B 110	A 120
B 100	A 140	D 100	C 120

13. (a) (i) Solve the following equations by Gauss elimination method: (8)

$x + y + z = 9$; $2x - 3y + 4z = 13$, $3x + 4y + 5z = 40$.

(ii) Find the dominant eigen value of $\begin{pmatrix} 1 & 3 & -1 \\ 3 & 2 & 4 \\ -1 & 4 & 10 \end{pmatrix}$ by power method. (8)

Or

(b) (i) If $A = \begin{pmatrix} 2 & 1 & 1 \\ 3 & 2 & 3 \\ 1 & 4 & 9 \end{pmatrix}$, find A^{-1} by Gauss-Jordan method. (8)

(ii) Solve the following equations by Gauss-Seidal method : (8)

$x + y + 54z = 110$, $27x + 6y - z = 85$, $6x + 15y + 2z = 72$.

14. (a) (i) From the following table of half-yearly premium for policies maturing at different ages, estimate the premium for policies maturing at age 46. (8)

Age x :	45	50	55	60	65
Premium y :	114.84	96.16	83.32	74.48	68.48

(ii) Find the function $f(x)$ from the following table by using Newton's divided difference formula : (8)

x :	1	2	7	8
$f(x)$:	1	5	5	4

Or

(b) (i) Find the parabola of the form $y = ax^2 + bx + c$ passing through the points (0, 0), (1, 1)(2, 20) using Lagrange's interpolation formula. (8)

(ii) Evaluate $\int_0^{\pi} \sin x \, dx$ dividing into ten equal parts by using Simpson's rule. (8)

15. (a) Use Runge-Kutta method of order 4 to find y at $x = 0.1, 0.2, 0.3$ given that $y' = x + y^2$, $y(0) = 1$. (16)

Or

(b) Given : $y' = x^2 + y^2 - 2$, $y(0) = 1$, use Taylor's method to find y at $x = -0.1, 0.1, 0.2$ and Milne's method to find y at $x = 0.3$. (16)

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