Reg. No. :

Question Paper Code : X 60773

B.E./B.Tech. DEGREE EXAMINATIONS, NOV./DEC. 2020
Fourth Semester
Mechanical Engineering
MA 2266/MA 1254/10177 SN 401/080120014/MA 42 – STATISTICS AND NUMERICAL METHODS
(Common to Automobile Engineering and Production Engineering)
(Regulations 2008/2010)

Time : Three Hours Maximum : 100 Marks

Statistical tables may be permitted.
Answer ALL questions.

PART – A **(10×2=20 Marks)**

1. Write any two applications of χ^2–test.

2. What are Type – I and Type – II errors ?

3. What do you understand by "Design of an experiment" ?

4. Write down the ANOVA table for one way classification.

5. Mention the order and condition for the convergence of Newton-Raphson method.

6. Compare Gauss elimination and Gauss-Jordan methods.

7. State the use of Lagrange's interpolation form.

8. Evaluate $\int_1^2 \frac{dx}{1+x^2}$, using trapezoidal rule, taking h = 0.5.

9. Using Euler's method, find y (0.2) if y' = x + y, y (0) = 1.

10. Distinguish between Runge-Kutta method and Predictor-Corrector method.

PART – B **(5×16=80 Marks)**

11\. a) i) A machine puts out 16 imperfect articles in a sample of 500. After it was overhauled, it puts out 3 imperfect articles in a sample of 100. Has the machine improved in its performance ? **(8)**

ii) Test whether there is any significant difference between the variances of the populations from which the following samples are taken :

Sample I :	20	16	26	27	23	22	
Sample II :	27	33	42	35	32	34	38

(8)

(OR)

b) i) A mathematics test was given to 50 girls and 75 boys. The girls made an average grade of 76 with a SD of 6, while boys made an average grade of 82 with a SD of 2. Test whether there is any significant difference between the performance of boys and girls. **(8)**

ii) A sample of 10 boys had the I.Q's : 70, 120, 110, 101, 88, 83, 95, 98, 100 and 107. Test whether the population mean I.Q. may be 100. **(8)**

12\. a) A completely randomized design experiment with 10 plots and 3 treatments gave the following results.

Treatment	**Yield**
A	5 7 3 1
B	4 4 7
C	3 5 1

Analyse the results for treatment effects. **(16)**

(OR)

b) The following data resulted from an experiment to compare three burners A, B, C. A Latin square design was used as the tests were made on 3 engines and were spread over 3 days.

A16	B17	C20
B16	C21	A15
C15	A12	B13

Test the hypothesis that there is no difference between the burners. **(16)**

13\. a) i) Solve the system of equations by Gauss – Jordan method.

$x + y + z + w = 1$; $2x - y + 2z - w = -5$; $3x + 2y + 3z + 4w = 7$; $x - 2y - 3z + 2w = 5$. **(8)**

ii) Solve by Gauss – Seidel method the following system.

$28x + 4y - z = 32$; $x + 3y + 10z = 24$; $2x + 17y + 4z = 35$. **(8)**

(OR)

b) i) Solve by Gauss – Elimination method
$3x + 4y + 5z = 18$; $2x - y + 8z = 13$; $5x - 2y + 7z = 20$. **(8)**

ii) Using power method, find the largest eigenvalue and its corresponding eigen vector of $A = \begin{bmatrix} 5 & 0 & 1 \\ 0 & -2 & 0 \\ 1 & 0 & 5 \end{bmatrix}$ **(8)**

14. a) i) Using Newton's divided difference formula find the value of f (8) for the following :

x :	4	5	7	10	11	13
f(x) :	48	100	294	900	1210	2028.

(8)

ii) Evaluate $\int_0^1 e^x dx$ using Simpson's ⅓ rule correct to five decimal places, taking h = .1. Verify your answer. **(8)**

(OR)

b) i) Find $\left(\frac{dy}{dx}\right)_{1.1}$ and $\left(\frac{d^2y}{dx^2}\right)$ for the following : **(8)**

x :	1.0	1.1	1.2	1.3	1.4	1.5	1.6
y :	7.989	8.403	8.781	9.129	9.451	9.750	10.031

ii) Using Lagrange's method find y (10) from the following : **(8)**

x :	5	6	9	11
y :	12	13	14	16

(8)

15. a) i) Using Milne's predictor-corrector method, find y (0.4), given that $y' = \frac{(1 + x^2)y^2}{2}$, y(0) = 1, y(0.1) = 1.06, y(0.2) = 1.12, y(0.3) = 1.21. **(8)**

ii) Solve by Euler's method, the equation $\frac{dy}{dx} = x + y$, y(0) = 0, choose h = 0.2 and compute y(0.4) and y(0.6). **(8)**

(OR) 2

b) i) Given $y' = x^2 - y$, y(0) = 1, y(0.1) = 0.9052, y (0.2) = 0.8213, find y(0.3) using Taylor's series method. **(6)**

ii) Using Runge-Kutta method of fourth order, given $y'' + xy' + y = 0$, y(0) = 1, y'(0) = 0, find the value of y at x = 0.1. **(10)**