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

Question Paper Code : 10401

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2012.

Fourth Semester

Mechanical Engineering

MA 2266/ 181402/ MA 42/ MA 1254/ 10177 SN 401/ 080120014 — STATISTICS AND NUMERICAL METHODS

(Common to Automobile Engineering and Production Engineering)

(Regulation 2008)

Time : Three hours | Maximum : 100 marks

Answer ALL questions.

Statistical tables may be permitted.

PART A — ($10 \times 2 = 20$ marks)

1. Define Type - I error and Type - II error.

2. State the applications of Chi-square test.

3. State the assumptions involved in ANOVA.

4. What are the advantages of a Latin square design?

5. Arrive a formula to find the value of $\sqrt[3]{N}$, where $N \neq O$, using Newton-Raphson method.

6. Solve the following system of equations, using Gauss-Jordan elimination method $2x + y = 3, x - 2y = -1$.

7. Form the divided difference table for the following data :

$x:$	5	15	22
$y:$	7	36	160

8. Evaluate $\int_{0.5}^{1} \frac{dx}{x}$ by Trapezoidal rule, dividing the range into 4 equal parts.

9. State the merits of RK - method over Taylor series method.

10. Write the central difference approximations for $\frac{dy}{dx}, \frac{d^2y}{dx^2}$.

PART B — $(5 \times 16 = 80$ marks)

11. (a) (i) A dice is thrown 400 times and a throw of 3 or 4 is observed 150 times. Test the hypothesis that the dice is fair. (8)

(ii) Theory predicts that the proportion of beans in four groups *A, B, C, D* should be 9:3:3:1. In an experiment among 1600 beans, the numbers in the four groups were 882, 313, 287 and 118. Does the experiment support the theory? (8)

Or

(b) (i) The means of two large samples of 1000 and 2000 members are 67.5 inches and 68.0 inches respectively. Can the samples be regarded as drawn from the same population of standard deviation 2.5 inches? (8)

(ii) Two random samples gave the following results :

Sample	Size	Sample mean	Sum of squares of deviation from the mean
1	10	15	90
2	12	14	108

Test whether the samples have come from the same normal population. (8)

12. (a) Four varities *A, B, C, D* of a fertilizer are tested in a RBD with 4 replications. The plot yields in pounds are as follows :

A12	D20	C16	B10
D18	A14	B11	C14
B12	C15	D19	A13
C16	B11	A15	D20

Analyse the experimental yield. (16)

Or

(b) A variable trial was conducted on wheat with 4 varieties in a Latin Square design. The plan of the experiment and per plot yield are given below :

C25	B23	A20	D20
A19	D19	C21	B18
B19	A14	D17	C20
D17	C20	B21	A15

Analyse the data. (16)

13. (a) (i) Using Newton-Raphson method, solve $x \log_{10} x = 12.34$ taking the initial value x_0 as 10. (8)

(ii) Find the numerically largest eigenvalue of $A = \begin{pmatrix} 1 & -3 & 2 \\ 4 & 4 & -1 \\ 6 & 3 & 5 \end{pmatrix}$ by power method. (8)

Or

(b) (i) Using Gauss Jordon method, find the inverse of $A = \begin{pmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & -4 \end{pmatrix}$. (8)

(ii) Solve the following system of equations using Gauss-Seidal iterative method.

$27x + 6y - z = 85,\ 6x + 15y + 2z = 72,\ x + y + 54z = 110$. (8)

14. (a) (i) Using Lagrange's interpolation, find the value of $f(3)$, from the following table: (8)

x :	0	1	2	5
$f(x)$:	2	3	12	147

(ii) Evaluate $\int_0^2 \frac{dx}{x^2 + x + 1}$ to three decimals, dividing the range of integration into 8 equal parts using Simpson's rule. (8)

Or

(b) (i) Using Newton's forward interpolation formula, find the polynomial $f(x)$ satisfying the following data. Hence evaluate $f(x)$ at $x = 5$. (8)

x :	4	6	8	10
$f(x)$:	1	3	8	16

(ii) Compute $f'(0)$ and $f''(4)$ from the following data : (8)

x :	0	1	2	3	4
$f(x)$:	1	2.718	7.381	20.086	54.598

15. (a) (i) Consider the initial value problem $\frac{dy}{dx} = y - x^2 + 1, y(0) = 0.5$. Using the modified Euler method find $y(0.2)$. (8)

(ii) Using Milne's method find $y(4.4)$ given $5xy' + y^2 - 2 = 0$ given $y(4) = 1, y(4.1) = 1.0049,\ y(4.2) = 1.0097,\ y(4.3) = 1.0143$. (8)

Or

(b) (i) Find $y(0.8)$ given that $y' = y - x^2, y(0.6) = 1.7379$ by using R-K method of order 4, taking $h = 0.1$. (8)

(ii) Solve the BVP $\frac{d^2y}{dx^2} - y = 0$, with $y(0) = 0$, $y(1) = 1$, using finite difference method with $h = 0.2$. (8)