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

Question Paper Code : 27331

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2015.

Fourth Semester

Mechanical Engineering

MA 6452 — STATISTICS AND NUMERICAL METHODS

(Common to Automobile Engineering, Mechatronics Engineering)

(Regulations 2013)

Time : Three hours Maximum : 100 marks

Use of statistical tables is permitted.

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. What is random sampling?
2. Write about F – test.
3. Write two advantages of completely randomized experimental design.
4. Is a 2×2 Latin square design possible? Why?
5. Compare Gauss elimination with Gauss seidel.
6. Obtain the iterative formula to find $\frac{1}{N}$ using Newton-Raphson method.
7. Give the Newton's backward difference table for

x:	0	1	2	3
y:	–1	–2	–1	2

8. Compare Trapezoidal rule with Simpson's $\frac{1}{3}$ rule.
9. If $y' = -y$, $y(0) = 1$ then find $y(.1)$ by Euler method.
10. What are single step and multistep methods? Give an example.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Test if the variances are significantly different for (8)

X1 :	24	27	26	21	25	
X2 :	27	30	32	36	28	23

(ii) The number of automobile accidents in a certain locality was 12, 8, 20, 2, 14 10, 15, 6, 9, 4. Are these frequencies in agreement with the belief that accident conditions were the same during this 10 week period. (8)

Or

(b) (i) A certain pesticide is packed into bags by a machine. A random sample of 10 bags is chosen and the contents of the bags is found to have the following weights (in kgs) 50, 49, 52, 44, 45, 48, 46, 45, 49 and 45. Test if the average quantity packed be taken as 50 kg. (8)

(ii) Given :

$\overline{X}_1 = 72$, $\overline{X}_2 = 74$

$s_1 = 8$, $s_2 = 6$

$n_1 = 32$, $n_2 = 36$

Test if the means are significant. (8)

12. (a) Given

Detergent	Engine		
	1	2	3
A	45	43	51
B	47	46	52
C	48	50	55
D	42	37	49

Perform ANOVA and test at .05 level of significance whether these are differences in the detergents or in the engines. (16)

Or

(b) Find out the main effects and interactions in the following 2^2 – factorial experiment and write down the ANOVA table. (16)

	I	a	b	ab
Block	00	10	01	11
I	64	25	30	6
II	75	14	50	33
III	76	12	41	17
IV	75	33	25	10

13. (a) (i) Find the +ve root of $x^4 - x - 9 = 0$ using Newton method. (8)

(ii) Find the largest eigen value and its corresponding eigen vector using Power method, for

$$A = \begin{pmatrix} 1 & -3 & 2 \\ 4 & 4 & -1 \\ 6 & 3 & 5 \end{pmatrix}.$$ (8)

Or

(b) (i) Solve by Gauss Seidel : (8)

$5x - 2y + z = -4$

$x + 6y - 2z = -1$

$3x + y + 5z = 13.$

(ii) Find the inverse of $A = \begin{pmatrix} 2 & 1 & 1 \\ 3 & 2 & 3 \\ 1 & 4 & 9 \end{pmatrix}$ by Gauss Jordan method. (8)

14. (a) (i) Given :

x :	0	2	3	4	7	9
y :	4	26	58	112	466	922

Find $y(10)$, $y'(6)$ using Newton's divided difference formula. (8)

(ii) Evaluate the integral $I = \int_0^1 \frac{dx}{1+x^2}$ using Simpson's $1/3$ rule by taking $h = 1/4$. (8)

Or

(b) (i) Evaluate $\int_1^2 \frac{dx}{1+x^2}$ taking $h = .2$ using trapezoidal rule. (8)

(ii) Given :

x :	140	150	160	170	180
y :	3.685	4.854	6.302	8.076	10.225

Find $y(175)$. (8)

15. (a) Using Runge-Kutta method of fourth order, solve $y' = \frac{y^2 - x^2}{x^2 + y^2}$ given $y(0) = 1$. Find y at $x = .2, .4, .6$. (16)

Or

(b) Compute $y(.5)$, $y(1)$ and $y(1.5)$ using Taylor's series for $y' = \frac{x + y}{2}$ with $y(0) = 2$ and hence find $y(2)$ using Milne's method. (16)

Table values for relevant problems

Table Values : (at 5% Los)

$|Z| = 1.96$, $t_8 = 2.31$, $t_9 = 2.26$, $F_{2,6} = 5.14$, $F_{3,6} = 4.76$, $F_{9,3} = 8.81$, $F_{3,9} = 3.86$, $F_{1,9} = 5.12$, $F_{4,5} = 5.19$, $F_{5,4} = 6.26$, $\psi_9^2 = 16.9$, $\psi_{10}^2 = 18.3$.