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Question Paper Code : 57506

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2016

Fourth Semester

Mechanical Engineering

MA 6452 – STATISTICS AND NUMERICAL METHODS

(Common to Fourth Semester Automobile Engineering and Mechatronics Engineering)

[Also common to Fifth Semester for Mechanical Engineering (Sandwich)]

Time : Three Hours **Maximum : 100 Marks**

Use of statistical tables is permitted.

Answer ALL questions.

PART – A (10 × 2 = 20 Marks)

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

2. Give the formula for the χ^2 – test of independence for

a	b
c	d

3. State the principles of Design of Experiments.

4. Is 2 × 2 Latin square Design possible ? Why ?

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

6. What is the procedure of Gauss-Jordan method ?

7. Specify the Newton's backward difference formulae for $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$

8. Write down the errors in Trapezoidal and Simpson's rules of numerical integration.

9. Find y(0.1) by Euler's method, if $\frac{dy}{dx} = x^2 + y^2$, y(0) = 0.1

10. Give the central difference approximations for y'(x), y"(x).

PART – B (5 × 16 = 80 Marks)

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

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

OR

(b) (i) 400 men and 600 women were asked whether they would like to have a flyover near their residence. 200 men and 325 women were in favour of the proposal. Test whether these two proportions are same.

(ii) The IQ's of 10 girls are respectively 120, 110, 70, 88, 101, 100, 83, 98, 95, 107. Test whether the population mean IQ is 100.

12. (a) Three varieties of coal were analysed by 4 chemists and the ash content is tabulated here. Perform an analysis of variance. **(16)**

		Chemists			
		A	B	C	D
Coal	I	8	5	5	7
	II	7	6	4	4
	III	3	6	5	4

OR

(b) The result of an RBD experiment on 3 blocks with 4 treatments A, B, C, D are tabulated here. Carry out an analysis of variance.

Blocks	Treatment effects			
I	A36	D35	C21	B36
II	D32	B29	A28	C31
III	B28	C29	D29	A26

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

$2x + y + 4z = 12,$

$8x - 3y + 2z = 20,$

$4x + 11y - z = 33,$

(ii) Using power method find the dominant eigen value of the matrix

$$\begin{pmatrix} 25 & 1 & 2 \\ 1 & 3 & 0 \\ 2 & 0 & -4 \end{pmatrix}$$

OR

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

(ii) Solve the following equations by Gauss-Seidel method

$x + y + 9z = 15,$

$x + 17y - 2z = 48,$

$30x - 2y + 3z = 75$

14. (a) (i) Interpolate y(12), if

x :	10	15	20	25	30	35
$y(x)$:	35	33	29	27	22	14

(ii) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ by Simpson's (1/3) rule, dividing the range into four equal parts.

OR

(b) (i) Find y'(1), if

x :	−1	0	2	3
$y(x)$:	−8	3	1	12

(ii) Using Trapezoidal rule, evaluate $\int_1^2 \int_1^2 \frac{dx \cdot dy}{x+y}$ with h = K = 0.5.

15. (a) If $\frac{dy}{dx} = x^2 + y^2$, $y(0) = 1$, find $y(0.1)$, $y(0.2)$ and $y(0.3)$ by Taylor series method. Hence find $y(0.4)$ by Milne's Predictor-Corrector method.

OR

(b) If $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$, $y(0) = 1$, find $y(0.2)$, $y(0.4)$, $y(0.6)$ by Runge-Kutta method. Hence find $y(0.8)$ by Milne's method.
