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

Question Paper Code : 50782

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2017
Fourth/Fifth Semester
Mechanical Engineering
MA8452 – STATISTICS AND NUMERICAL METHODS
(Regulations 2017

(Common to Mechanical Engineering (Sandwich), Automobile Engineering, Mechatronics Engineering)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions.

PART – A (10×2=20 Marks)

1. What is meant by level of significance and critical region ?
2. State any two applications of Chi-square test.
3. What is the aim of the design of experiment ?
4. What is a completely randomized design ?
5. What are the merits of Newton-Raphson method ?
6. Distinguish between Gauss elimination and Gauss-seidel methods.
7. What is meant by interpolation ?
8. What is the order of error in Trapezoidal and Simpson's one-third rules ?
9. What is main difference between single and multistep methods in solving first order ordinary differential equation ?
10. State the modified Euler's formula for first order ordinary differential equation.

PART – B (5×16=80 Marks)

11. a) i) A random sample of 100 bulbs from a company P shows a mean life 1300 hours and standard deviation of 82 hours. Another random sample of 100 bulbs from company Q showed a mean life 1248 hours and standard deviation of 93 hours. Are the bulbs of company P superior to bulbs of company Q at 5% level of significance ? (8)

ii) A random sample of 10 boys has the following IQ's 70, 83, 88, 95, 98, 100, 101, 107, 110 and 120. Do these data support the assumption of a population mean IQ of 100 at 5% level of significance ?

(OR)

b) i) Time taken by workers in performing a job is given below :

Method 1	20	16	26	27	23	22
Method 2	27	33	42	35	34	38

Test whether there is any significant difference between the variances of the time distribution at 5% level of significance. (8)

ii) Using the data given in the following table to test at 1% level of significance whether a person's ability in Mathematics is independent of his/her interest in Statistics.

		Ability in Mathematics		
		Low	Average	High
Interest in Statistics	Low	63	42	15
	Average	58	61	31
	High	14	47	29

(8)

12. a) The following data represent a certain person to work from Monday to Friday by four different routes.

		Days				
		Mon	Tue	Wed	Thu	Fri
Routes	1	22	26	25	25	31
	2	25	27	28	26	29
	3	26	29	33	30	33
	4	26	28	27	30	30

Test at 5% level of significance whether the differences among the means obtained for the different routes are significant and also whether the differences among the means obtained for the different days of the week are significant. (16)

(OR)

b) Four air-conditioning compressor designs were tested in four different regions of India. The test was repeated by installing additional air conditioners in a second cooling season. The following are the times to failure (to the nearest month) of each compressor tested.

		Replicate 1				Replicate 2			
		A	B	C	D	A	B	C	D
Design	Northeast	58	35	72	61	49	24	60	64
	Southeast	40	18	54	38	38	22	64	50
	Northwest	63	44	81	52	59	16	60	48
	Southwest	36	09	47	30	29	13	52	41

(16)

Test at the 0.05 level of significance whether the differences among the means determined for designs, for regions, and for replicates are significant and for significance of the interaction between compressor designs and regions. (16)

13. a) i) Find, by Newton-Raphson method, a positive root of the equation $3x - \cos x - 1 = 0$, correct to 4 decimal places. (8)

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

(OR)

b) i) Solve, by Gauss-Seidel method, the system of following equations, correct to three decimal places.

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

ii) Find the numerically largest Eigenvalue and the corresponding eigenvector of a matrix $A = \begin{pmatrix} 25 & 1 & 2 \\ 1 & 3 & 0 \\ 2 & 0 & -4 \end{pmatrix}$. (8)

14. a) i) Using Lagrange's interpolation formula, find the polynomial f(x) form the following data : (8)

x	:	0	1	4	5
f(x)	:	4	3	24	39

ii) Find the value of cos(1.74), using suitable formula from the following data. (8)

x	:	1.7	1.74	1.78	1.82	1.86
sin(x)	:	0.9916	0.9857	0.9781	0.9691	0.9584

(OR)

b) i) From the following values, find f(x) and hence find f (6) by Newton's divided difference formula. (8)

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

ii) Evaluate $\int_1^{1.2}\int_1^{1.4} \frac{1}{1+x}\,dxdy$ by Trapezoidal rule with h = k = 0.1. (8)

15. a) i) Using Taylor series method, find the value of y at x = 0.1, if y satisfies the equation $\frac{dy}{dx} = x^2 - y$ given that y = 1 when x = 0, correct to 3 decimal places. (8)

ii) Solve the equation $\frac{d^2y}{dx^2} = x + y$ with boundary conditions y (0) = 1 = y(1) by finite difference method, by taking 4 subintervals. (8)

(OR)

b) i) Using R-K method of fourth order, find the value of y at x = 0.1, if y satisfies the equation $\frac{dy}{dx} = x + y^2$ given that y = 1 when x = 0, correct to 3 decimal places. (8)

ii) Given $\frac{dy}{dx} = x^3 + y, y(0) = 2, y(0.2) = 2.073, y(0.4) = 2.452, y(0.6) = 3.023,$ compute y (0.8) by Milne's method. (8)