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**Question Paper Code : 91785**

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2019

Fourth Semester

Mechanical Engineering

MA 6452 – STATISTICS AND NUMERICAL METHODS

(Regulations 2013)

Time : Three Hours

Maximum : 100 Marks

Use of Statistical tables is permitted.

Answer ALL questions.

PART – A

(10×2=20 Marks)

1. State the procedure followed in testing of hypothesis.
2. Define Type I error and Type II error in the sampling distribution.
3. State the principles of Design of Experiments.
4. Is  $2 \times 2$  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. Given  $f(2) = 5$ ,  $f(2.5) = 5.5$  find the linear interpolating polynomial using Lagrange interpolation.
8. Construct the divided difference table for the data.

x	0.5	1.5	3.0	5.0	6.5	8.0
F(x)	1.625	5.875	31	131	282.125	521
9. Compute  $y(0.1)$  correct to 4 decimal places if  $y(x)$  satisfies  $y' = x + y$ ,  $y(0) = 1$ , by Taylor's series method.
10. Write down the modified Euler formulae for  $y' = f(x, y)$ .



## PART – B

(5×16=80 Marks)

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

$x_1$	24	27	26	21	25	
$x_2$	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

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

$$s_1 = 8, s_2 = 6$$

$$n_1 = 32, n_2 = 36$$

Test if the means are significant. (8)

12. a) i) The accompanying data resulted from an experiment comparing the degree of soiling for fabric copolymerized with the 3 different mixtures of methacrylic acid. Analyse the classification. (6)

Mixture 1	0.56	1.12	0.90	1.07	0.94
Mixture 2	0.72	0.69	0.87	0.78	0.91
Mixture 3	0.62	1.08	1.07	0.99	0.93

ii) A variable trial was conducted on wheat with 4 varieties in a Latin square design. The plan of the experiment is given below. Analyse data and interpret the result. (10)

C	25	B	23	A	20	D	20
A	19	D	19	C	21	B	18
B	19	A	14	D	17	C	20
D	17	C	20	B	21	A	15

(OR)



b) i) A set of data involving 4 tropical food stuffs A, B, C, D tried on 20 chicks is given below. All the 20 chicks are treated alike in all respects except the feeding treatments and each feeding treatment is given to 5 chicks.

Analyse the data :

(7)

A	55	49	42	21	52
B	61	112	30	89	63
C	42	97	81	95	92
D	169	137	169	85	154

ii) Perform a 2-way ANOVA on the data given below.

(9)

		Treatment 1		
		1	2	3
Treatment 2	1	30	26	38
	2	24	29	28
	3	33	24	35
	4	36	31	30
	5	27	35	33

Use the coding method subtracting 30 from the given number.

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

(8)

$$\begin{aligned} 2x + y + 4z &= 12, \\ 8x - 3y + 2z &= 20, \\ 4x + 11y - z &= 33, \end{aligned}$$

ii) Using power method find the dominant eigenvalue of the matrix.

(8)

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

(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.

(8)

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

(8)

$$\begin{aligned} x + y + 9z &= 15, \\ x + 17y - 2z &= 48, \\ 30x - 2y + 3z &= 75 \end{aligned}$$



14. a) i) Use Lagrange's interpolation formula to find  $f(10)$  from the following data. (8)

x :	5	6	9	11
f(x)	12	13	14	16

- 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) Use Newton's backward difference formula to fit a third degree polynomial for the following data : (8)

x :	-0.75	-0.5	-0.25	0
f(x) :	-0.0718125	-0.02475	0.3349375	1.10100

- ii) Evaluate  $\int_0^1 \frac{1}{1+x} dx$ , using

- 1) Trapezoidal rule and (4)
- 2) Simpson's  $\frac{1}{3}$  rule with  $h = 0.125$  and compare the values with exact value. (4)

15. a) i) Solve the equation  $y^u = x + y$  with the boundary values  $y(0) = y(1) = 0$  with  $h = \frac{1}{4}$  using finite difference method. (8)

- ii) Apply Taylor's method to obtain approximate value of  $y$  at  $x = 0.2$  for the differential equation  $y' = 2y + 3e^x$ ,  $y(0) = 0$ . Compare the numerical solution with its exact solution. (8)

(OR)

- b) Using R.K. fourth order method to find  $y$  at  $x = 0.1, 0.2, 0.3$  given that  $y' = xy + y^2$ ,  $y(0) = 1$ . Continue the solution at  $x = 4$  using Milne's P-C method. (16)