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

Question Paper Code : 42773

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2018

Fourth Semester

Mechanical Engineering

MA 2266 – STATISTICS AND NUMERICAL METHODS

(Common to Production Engineering/Automobile Engineering)

(Regulations 2008)

Time : Three Hours | Maximum : 100 Marks

Use of Statistical Table is permitted.

Answer ALL questions.

PART – A **(10×2=20 Marks)**

1. Define Sampling and Random sampling.
2. What is the assumption of t-test ?
3. What is a completely randomized design ?
4. What are the basic principles of the design of experiments ?
5. Evaluate $\sqrt{5}$ (correct to four decimal places) by Newton's iteration method.
6. Solve by Gauss elimination method $5x - y = -3$, $x + 3y = 5$.
7. Prove that the divided difference operator Δ is linear.
8. Apply Lagrange's formula inversely to obtain a root of the equation $f(x) = 0$, given that $f(30) = -30$, $f(34) = -13$ and $f(38) = 3$.
9. Is the formula $y_{m+1} = a_0 y_m + h(b_0 y'_m + b_1 y'_{m-1})$ a predictor or a corrector ? Why ?
10. Solve $y' = t + y$, $y(0) = 1$ find $y(0.3)$ when $h = 0.1$, using Euler's method.

PART – B **(5×16=80 Marks)**

11. a) i) Prove that the expected value of the sample is the population mean **(8)**

ii) A certain medicine administered to each of 10 patients resulted in the following increases in the blood pressure 8, 8, 7, 5, 4, 1, 0, 0, –1, –1. Can it be concluded that the medicine was responsible for the increase in the blood pressure. **(8)**

(OR)

b) i) A random sample of site 25 from a population gives the sample standard deviation 8.5. Test the hypothesis that the population standard deviation is 10. **(8)**

ii) Two samples of sizes nine and eight gave the sums of squares of deviation from their respective means equal to 160 and 91 respectively. Can they be regarded as drawn from the same normal population. **(8)**

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

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

(16)

Analyze data and interpret its result.

(OR)

b) A random sample is selected from each of 3 makes of ropes and their breaking strength (in certain units) are measured with the following results :

I : 70, 72, 75, 80, 83

II : 60, 65, 57, 84, 87, 73

III : 100, 110, 108, 112, 113, 120, 107

Test whether the breaking strength of the ropes differ significantly.

13. a) Solve the following system of equation by Jacob's iteration method and Gauss Seidal iteration method. $10x + 2y + z = 9$, $x + 10y - z = -22$; $-2x + 3y + 10z = 22$. **(16)**

(OR)

b) 1) Find A^{-1}, if $A = \begin{bmatrix} 8 & -4 & 0 \\ -4 & 8 & -4 \\ 0 & -4 & 8 \end{bmatrix}$ by Gauss Jordan method. **(10)**

2) Find the numerically larger eigenvalue of the matrix $A = \begin{bmatrix} 3 & -5 \\ -2 & 4 \end{bmatrix}$ by power method. Find the other eigenvalue of A. **(6)**

14. a) 1) Find the first and second derivative of $y = f'(x)$ at $x = 1.5$ from the data. Also find $f'(x)$ at $x = 3.5$ in Newton's forward and backward difference methods. **(10)**

X :	1.5	2	2.5	3	3.5	4
Y :	3.375	7	13.625	24	28.875	59

2) Use Newton's divided difference formula to find f(x) from the following data : **(6)**

x	0	2	3	4	6	7
f(x)	0	8	0	–72	0	1008

(OR)

b) 1) Evaluate $\int_0^1 \int_0^1 e^{x+y}\, dx\, dy$ using i) Trapezoidal rule ii) Simpson's 1/3 rule and taking $h = k = 0.5$. **(10)**

2) If $y(0) = 35.3$, $y(15) = 32.4$, $y(20) = 29.2$, $y(25) = 26.1$, $y(30) = 23.2$ and $y(35) = 20.5$, find $y(12)$ using Newton's forward interpolation formula. **(6)**

15. a) 1) Using Taylor's series method, find y at $x = 1.1$ by solving the equation

$$\frac{dy}{dx} = x^2 + y^2 ; y(1) = 2.$$ **(8)**

2) Given that $\frac{dy}{dx} = 1 + y^2$; $y(0.6) = 0.6841$, $y(0.4) = 0.4228$, $y(0.2) = 0.2027$, $y(0) = 0$, find $y(-0.2)$. Using Milne's predictor corrector method. **(8)**

(OR)

b) 1) Find the value of $y(1.1)$, using Runge-Kutta method of the fourth order, given that $\frac{dy}{dx} = y^2 + xy$; $y(1) = 1$. **(8)**

2) Solve the equation $y''(x) = xy(x) = 0$ for $y(x_i)$, $x_i = 0, 1/3, 2/3$ given that $y(0) + y'(0) = 1$ and $y(1) = 1$. **(8)**