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

Question Paper Code : 90344

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

Fourth Semester

Mechanical Engineering

MA 8452 – STATISTICS AND NUMERICAL METHODS

(Common to Automobile Engineering/Mechanical Engineering/Mechatronics Engineering/Production Engineering/Robotics and Automation Engineering)

(Regulations 2017)

Time : Three Hours | Maximum : 100 Marks

(Statistical Tables are permitted)

Answer ALL questions.

PART – A **(10×2=20 Marks)**

1. Explain the terms sample size and sampling error in random sampling.
2. Define Type I and Type II errors in testing of hypothesis.
3. What is the main aim of design of experiments ?
4. What are the assumptions to be followed in the analysis of variance ?
5. Derive the Newton's iterative formula to find $\sqrt{N}$ where N is a positive real number.
6. Find the largest eigenvalue and the corresponding eigenvector of the matrix $\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$ using power method.
7. Find the divided difference table for the following data.

x	2	3	5
y	0	14	102

8. For using Simpson's 1/3 rule, what is the condition about the intervals.
9. Using Euler's method, find y at x = 0.1 if $y^1 = 1 + xy$ given that y(0) = 2.
10. How many prior values are required in Milne's method to predict the next value ?

PART – B **(5×16=80 Marks)**

11. a) i) A sample of heights of 6400 Englishmen has a mean of 67.85 inches and a S.D. of 2.56 inches, while a sample of heights of 1600 Australians has a mean of 68.55 inches and a S.D. of 2.52 inches. Do the data indicate that Australians are on the average taller than Englishmen. **(8)**

ii) A sample analysis of examination results of 1000 students were made and it was found that 260 failed, 110 first class, 420 second class and rest obtained third class. Do these data support the general examination result in the ratio 2 : 1 : 4 : 3. **(8)**

(OR)

b) i) The independent samples from normal populations with equal variance gave the following : **(8)**

Sample	Size	Mean	S.D.
1	16	23.4	2.5
2	12	24.9	2.8

Is the difference between the means significant ?

ii) Two samples of sizes 9 and 8 give the sum of the squares of deviations from their respective means equal to 160 and 91 respectively. Can they be regarded as drawn from the same normal population ? **(8)**

12. a) The table shows the yield of paddy in arbitrary units obtained from four different varieties planted in five blocks where each block is divided into four plots. Test at 5% level whether the yields vary significantly with (i) soil differences (ii) differences in the type of paddy. **(16)**

Blocks	Types of Paddy			
	I	II	III	IV
A	12	15	10	14
B	15	19	12	11
C	14	18	15	12
D	11	16	12	16
E	16	17	11	14

(OR)

b) Analyse the variance in the Latin square of yields (in kgs) of paddy where P, Q, R, S denote the different methods of cultivation. **(16)**

S122	P121	R123	Q122
Q124	R123	P122	S125
P120	Q119	S120	R121
R122	S123	Q121	P122

Examine whether the different methods of cultivation have given significantly different yields.

13. a) i) Find the positive root of $f(x) = 2x^3 - 3x - 6 = 0$ by Newton's method correct to 5 decimal places. **(8)**

ii) Solve the system of equations by Gauss elimination method.

$x + 2y + z = 3$; $2x + 3y + 3z = 10$ & $3x - y + 2z = 13$. **(8)**

(OR)

b) i) Solve the equation $x^3 + x^2 - 1 = 0$ by using fixed point iteration method. **(8)**

ii) Solve the following system of equations by Gauss-Jacobi method.

$4x_1 + x_2 + x_3 = 6$; $x_1 + 4x_2 + x_3 = 6$; $x_1 + x_2 + 4x_3 = 6$. **(8)**

14. a) i) Use Lagrange's formula for the following data and hence find the value of y at $x = 1$. **(8)**

x	–1	0	2	3
y	–8	3	1	12

ii) Evaluate $\int_0^1 \int_0^1 e^{x+y} dxdy$ by using Trapezoidal rule with $h = k = 0.5$. **(8)**

(OR)

b) i) Using Newton's divided difference formula, find the polynomial equation for the given data. **(8)**

x	–1	0	1	3
y	2	1	0	–1

ii) Evaluate $\int_0^1 \left(\frac{1}{1+x^2}\right) dx$ with $h = \frac{1}{6}$ by using Simpson's rule. **(8)**

15. a) i) Solve $y^1 = x + y^2$ with $y(0) = 1$ by using Taylor's series method and find the value of $y(0.1)$. **(8)**

ii) Apply Runge-Kutta method of fourth order to determine $y(0.1)$ with $h = 0.1$ from $\frac{dy}{dx} = x^2 + y^2, y(0) = 1$. **(8)**

(OR)

b) i) Using Modified Euler's method, find $y(0.1)$, $y(0.2)$ given that $y^1 = y + e^x$ with $y(0) = 0$. **(8)**

ii) Given $\frac{dy}{dx} = x^2 (1 + y)$ and $y(1) = 1$, $y(1.1) = 1.233$, $y(1.2) = 1.548$, $y(1.3) = 1.979$, evaluate $y(1.4)$ by using Milne's method. **(8)**
