(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

(2) Simpson's $\frac{1}{3}$ rule with $h = 0.125$ and compare the values with exact value. (8)

15. (a) Given $\frac{dy}{dx} = xy + y^2$, $y(0) = 1$, $y(0.1) = 1.1169$, $y(0.2) = 1.2773$, find

(i) $y(0.3)$ by Runge- Kutta method of fourth order and

(ii) $y(0.4)$ by Milne's method. (16)

Or

(b) (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 $\frac{dy}{dx} = x + y$, $y(0) = 1$ by modified Euler's method to find $y(0.2)$ with $h = 0.1$. (8)

———————

Reg. No. : [ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ]

Question Paper Code : 20753

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2018.

Fourth Semester

Mechanical Engineering

MA 6452 — STATISTICS AND NUMERICAL METHODS

(Common to Fourth Semester Automobile Engineering, Mechatronics Engineering and Fifth Semester for Mechanical Engineering (Sandwich))

(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. What are basic principles of design of experiment?

4. What is a 2^2 factorial design?

5. Find the iterative formula by Newton's method for $\frac{1}{N}$, where N is a positive integer.

6. What kind of an eigenvalue and eigenvector of a matrix would be obtained by Power method?

7. Find the third divided differences of $f(x) = x^3 + x + 2$ for the arguments 1, 3, 6, 11.

8. Write Newton's backward difference formula to find the derivatives $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at $x = x_n$.

9. Find $y(0.01)$ by using Euler's method, given that $\frac{dy}{dx}=-y, y(0)=1$.

10. Write the finite difference approximation for the equation $\frac{d^2y}{dx^2}=x+y$.

PART B — (5 × 16 = 80 marks)

11. (a) (i) The mean height of two samples of 1000 and 2000 members are respectively 67.5 and 68.0 inches. Can they be regarded as drawn from the same population with standard deviation 2.5 inches 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? (8)

Or

(b) (i) Pumpkins were grown under two experimental conditions. Two random samples of 11 and 9 pumpkins show the sample standard deviations of their weights as 0.8 and 0.5 respectively. Assuming that the weight distributions are normal, test the hypothesis that the true variances are equal, against the alternative hypothesis that they are not at the 10% level of significance. (8)

(ii) Using the data given in the following table to test at the 0.01 level of significance whether a person's ability in Mathematics is independent of his/her interest in Statistics. (8)

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

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
	1	22	26	25	25	31
Routes	2	25	27	28	26	29
	3	26	29	33	30	33
	4	26	28	27	30	30

Test at the 0.05 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) The following is the Latin square layout of a design when 4 varieties of seeds are tested. Set up the ANOVA table and state your conclusions. (16)

A18	C21	D25	B11
D22	B12	A15	C19
B15	A20	C23	D24
C22	D21	B10	A17

13. (a) (i) Using Gauss-Jordan method, find the inverse of $A=\begin{pmatrix} 3 & -1 & 1 \\ -15 & 6 & -5 \\ 5 & -2 & 2 \end{pmatrix}$. (8)

(ii) Solve, by Gauss-Seidel method, the system of following equations correct to three decimal places $x+3y+10z=24$, $28x+4y-z=32$, $2x+17y+4z=35$. (8)

Or

(b) (i) Solve, by Gauss-Elimination with partial pivoting method, the system of following equations correct to three decimal places

$2x+y+z=10$, $3x+2y+3z=18$, $x+4y+9z=16$. (8)

(ii) Solve, by Gauss-Jacobi method, the system of following equations correct to three decimal places

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

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