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

Question Paper Code : 51778

B.E/B.Tech. DEGREE EXAMINATION, MAY/JUNE 2016

Fourth Semester

Mechanical Engineering

MA 2266/MA 42/MA 1254/080120014/10177 SN 401 – STATISTICS AND NUMERICAL METHODS

(Common to Automobile Engineering and Production Engineering)

(Regulations 2008/2010)

Time : Three Hours **Maximum : 100 Marks**

Statistical tables may be permitted.

Answer ALL questions.

PART – A (10 × 2 = 20 Marks)

1. What are Type I and Type II risk ?

2. Present the test statistics for small samples concerning difference between two means.

3. What is a 2^2 factorial design ?

4. Compare one-way classification with two-way classification.

5. Write the iterative formula and the order of convergence of Newton-Raphson method.

6. Compare Gauss-Elimination with Gauss-Seidel method.

7. Create the table for the following data using Newton's divided difference formula :

x :	4	5	7	10	11	13
$f(x)$:	48	100	294	900	1210	2028

8. Compare trapezoidal rule with Simpson's $\frac{1}{3}$ rule.

9. Given the two methods : Taylor's series and R.K. method – which is better ? Why ?

10. Express $(\Delta^2 - 3\Delta + 2)$ interms of the operator E.

PART – B (5 × 16 = 80 Marks)

11. (a) (i) Test if the means are significantly different for the following data : **(8)**

X_1 :	5	6	8	1	12	4	3	9	6	10
X_2 :	2	3	6	8	10	1	2	8		

(ii) Random samples of 200 bolts manufactured by machine A and 100 bolts manufactured by machine B showed 19 and 5 defective bolts respectively. Test the hypothesis at 5% level of significance that the two machines are showing different qualities of performance. **(8)**

OR

(b) (i) Do the sample variances vary significantly for the following data : **(8)**

Sample I :	39	41	43	41	45	39	
Sample II :	40	42	40	44	39	38	40

(ii) The following data represents the no. of books borrowed from a library during the various days of the week.

Days of the week :	Mon	Tue	Wed	Thu	Fri	Sat	Sun
No. of books :	14	16	8	12	11	9	14

Find if the books borrowed one uniformly distributed over the week. **(8)**

12. (a) Carryout an ANOVA for the following : **(16)**

Consignment

Observer	1	2	3	4	5	6
1	9	10	9	10	11	11
2	12	11	9	11	10	10
3	11	10	10	12	11	10
4	12	13	11	14	12	10

OR

(b) Perform Analysis of variance for the 2^2 experiment and draw your conclusions for the following data : **(16)**

Block	**Yields (Potato)**			
I	(1)	a	b	ab
	23	25	22	38
II	b	(1)	a	ab
	40	26	36	38
III	(1)	a	ba	b
	29	20	30	20
IV	ab	a	b	(1)
	34	31	24	28

13. (a) (i) Solve by Gauss-Seidel, the equations **(8)**

$20x + y - 2z = 17$

$3x + 20y - z = -18$

$2x - 3y + 20z = 25$

Standing with $(0, 0, 0)^T$

(ii) Using power method, find the longest Eigen value and its corresponding Eigen vector from **(8)**

$$A = \begin{pmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{pmatrix}$$

OR

(b) (i) Using Newton-Raphson's method, find the root of $x^4 - x - 10 = 0$, nearing to 2, correct to 3 decimal places. **(8)**

(ii) Find the inverse of $A = \begin{pmatrix} 1 & 1 & 1 \\ 4 & 3 & -1 \\ 3 & 5 & 3 \end{pmatrix}$ using Gauss-Jordan method. **(8)**

14. (a) (i) Using Lagrange's method, find the polynomial $f(x)$ given that $f(0) = 2$, $f(1) = 3$, $f(2) = 12$ & $f(3) = 35$. Hence find $f(5)$. **(8)**

(ii) Find $\frac{dy}{dx}$ for $x = 1.05$ from the following data :

x :	1.00	1.05	1.1	1.15	1.2	1.25	1.3
y :	1	1.0247	1.04881	1.07238	1.09544	1.11803	1.14017

OR

(b) (i) Using Simpson's $\frac{1}{3}$ rule, evaluate $\int_0^{20} V\,dt$ for the following data : **(8)**

t :	2	4	6	8	10	12	14	16	18	20
V :	10	18	25	29	32	20	11	5	2	0

(ii) Find y when $x = 410$ for the following : **(8)**

x :	100	150	200	250	300	350	400
y :	10.63	13.03	15.04	16.81	18.42	19.9	21.27

15. (a) (i) Using R.K. method 4th order, find y(0.2) with h = 0.1 for $\frac{dy}{dx} = \sqrt{x + y}$, $y(0) = 1$. **(8)**

(ii) Apply Euler's modified method to solve $\frac{dy}{dx} = x + 3y$, $y(0) = 1$, to find y when $x = 1$. **(8)**

OR

(b) Given $\frac{dy}{dx} = \frac{1}{2}(1 + x^2)y^2$ and $y(0) = 1$. Find the values of y for $x = 0.1$, 0.2 and 0.3 using Taylor's series and hence find y(0.4) by Milne's Predictor-Corrector method. **(16)**
