

**6E3054**

Roll No. \_\_\_\_\_

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**6E3054****B. Tech. VI Semester (Main/Back) Examination, May/June-2011****Mechanical Engineering****6ME6 Numerical Methods and Applied Statistics****Time : 3 Hours****Maximum Marks : 80****Min. Passing Marks : 24****Instructions to Candidates:**

*Attempt any five questions, selecting one question from each unit. All questions carry equal marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.)*

**Unit - I**

1. a) Find the real root of the equation  $x^2 + 4 \sin x = 0$ . Correct to four decimal places by using Newton-Raphson's method. (8)
- b) Apply Graeffe's root squaring method to solve the equation
- $$x^3 - 8x^2 + 17x - 10 = 0 \quad (8)$$

**OR**

- a) Find the root of the equation  $xe^x = \cos x$  using the secant method correct to four decimal places. (8)
- b) Find the real root of the equation  $x^3 - 2x - 5 = 0$  by bisection method correct to three places of decimals. (8)

**Unit - II**

2. a) Using the partition method, find the inverse of the matrix

$$\begin{bmatrix} 13 & 14 & 6 & 4 \\ 8 & -1 & 13 & 9 \\ 6 & 7 & 3 & 2 \\ 9 & 5 & 16 & 15 \end{bmatrix} \quad (8)$$

b) The ordinates of the normal curve are given by the following table :

x:	0.0	0.2	0.4	0.6	0.8
y:	0.3989	0.3910	0.3683	0.3332	0.2897

Evaluate

i)  $y(.43)$  and

ii)  $y(.62)$

(8)

OR

a) Determine the largest eigen value and the corresponding eigen vector of the matrix

$$\begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix} \text{ by power method.} \quad (6)$$

b) Use Stirling formula to compute  $u_{12.2}$  from the following table :

x:	10	11	12	13	14
$10^5 u_x$ :	23967	28060	31788	35209	38368

(6)

c) By means of Newton's divided difference formula find the value of  $f(8)$  from the following table :

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

(4)

Unit - III

3. a) Evaluate  $\int_0^1 \frac{dx}{1+x^2}$  by using Simpson's  $\frac{1}{3}$  and  $\frac{3}{8}$  rules. Hence obtain the approximate value of  $\pi$  in each case. (6)

b) Use Milne's Predictor - Corrector method to obtain  $y(.8)$  and  $y(1.0)$  for the following differential equation  $\frac{dy}{dx} = x - y^2$ ,

given that

x:	0.0	0.2	0.4	0.6
y:	0.0000	0.0200	0.0795	0.1762

(10)

OR

- a) Given that  $\frac{dy}{dx} = x + y^2$  and  $y = 1$  at  $x = 0$ . Find an approximate value of  $y$  at  $x = 0.3$  by Euler's modified method by taking  $h = 0.1$ . (6)
- b) Use Runge-Kutta method of fourth order to find  $y$  when  $x = 1.2$  in steps of 0.1, given that

$$\frac{dy}{dx} = x^2 + y^2 \text{ and } y(1) = 1.5. \quad (10)$$

Unit - IV

4. a) Define the  $r^{\text{th}}$  moment about the mean. The first four moments of a distribution about the value of 4 of the variables are -1.5, 17, -30 and 108. Find the moment about the mean,  $\beta_1, \beta_2$  and comment upon the nature of the distribution. (8)
- b) Define the Normal distribution. If the heights of 300 students are normally distributed with mean 64.5 inches and standard deviation 3.3 inches, how many students have heights.
- i) less than 5 feet
- ii) between 5 feet and 5 feet 9 inches. (8)

OR

- a) In a large city A, 20% of a random sample of 900 school boys had defective eye sight. In another large city B, 15.5% of a random sample of 1600 school boys had the same defect. Is this difference between the two populations significant? (8)
- b) Define the poisson distribution, Razor blades are supplied by a manufacturing company in packets of 10. There is a probability of 1 in 100 blades to be defective. Calculate the number of packets containing one defective blade, no defective blade and all defective blades in a consignment of 10,000 packets. (8)

Unit - V

5. a) Five coins are tossed 3200 times and the following results are obtained :

No. of heads :	0	1	2	3	4	5
Frequency :	80	570	110	900	500	50

If  $\chi^2$  for 5 d.f. at 5% level of significance be 11.07, test the hypothesis that the coins are unbiased. (8)

- b) Obtain the coefficient of correlation for  $x$  and  $y$  from the following data :

$x$ : 45 55 56 58 60 65 68 70 75 80 85

$y$ : 56 50 48 60 62 64 65 70 74 82 90

Obtain also the equations of the lines of regressions. (8)

OR

- a) For a random sample of 10 pigs, fed on diet A, the increases in weight in a certain period were 10, 6, 16, 17, 13, 12, 8, 14, 15, 9 lbs.

For another random sample of 12 pigs, fed on diet B, the increases in the same period were 7, 13, 22, 15, 12, 14, 18, 8, 21, 23, 10, 17 lbs.

Test whether the diets A and B differ significantly as regards the effect on increase in weight (or test whether the mean increase in the two sample are significantly different). Use the fact that 5% value of  $t$  for 20 d.f. is 2.09.

(8)

- b) In a partially destroyed laboratory record of an analysis of correlation data, the following results only are legible; variance of  $x = 9$

Regression equation :  $8x - 10y + 66 = 0$ ;  $40x - 18y = 214$ .

Find

- i) The mean values of  $x$  and  $y$ .
- ii) The standard deviation of  $y$ .
- iii) Coefficient of correlation between  $x$  and  $y$ .

(8)