Total No. of Questions: 09

B.Tech. (ME) (2011 Onwards) (Sem.– 6)

STATISTICAL AND NUMERICAL METHODS IN ENGINEERING

M Code: 71188

Subject Code: BTME-604

Paper ID: [A2364]

Time: 3 Hrs. **Max. Marks: 60**

INSTRUCTIONS TO CANDIDATES:

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION A

1. a) Define standard deviation.

   b) Let two fair dice be rolled. If the sum of 7 is obtained, find the probability that at least one of the dice shows 2.

   c) Derive the formula for mean of binomial distribution.

   d) $Sin\,x = x - \frac{x^3}{\angle 3} + \frac{x^5}{\angle 5} - ..... + \frac{(-1)^n x^{2n-1}}{\angle 2n-1}$. Find its approximate value if $x = 0.2$, using three terms of the expansion.

   e) Derive sufficient condition for convergence of Newton-Raphson method.

   f) By using Power method calculate the dominant eigen values of $\begin{bmatrix} 4 & 1 \\ 1 & 3 \end{bmatrix}$

   g) Find a polynomial P(x) of degree 2 such that P(1) = 1, P(3) = 27 and P(4) = 64.

   h) Write Adam's Predictor- Corrector Formulas.

   i) Using Lagranges interpolation formula express $\dfrac{x^2 + 6x - 1}{(x-1)(x-4)(x-6)}$ as a sum of partial fractions.

   j) Using Stirling's formula to find y_{35} given that $y_{20} = 512$, $y_{30} = 439$, $y_{40} = 346$ and $y_{50} = 243$.

SECTION B

2. The mean height of 500 students is 151cm and the standard deviation is 15cm. Assuming that the heights are normally distributed, find the number of students whose heights lies between 120 and 155cm.

3. Use Newton-Raphson method solve $2x^2 + 3xy + y^2 = 3$, $4x^2 + 2xy + y^2 = 30$, at least up to two Iterations, near $x_0 = -3$ and $y_0 = 2$.

4. Derive Simpson's 1/3 rule and hence use it to evaluate $\int_0^1 \frac{dx}{1+x}$.

5. Find the value of $y(1.5)$ using Runge Kutta method of fourth order by using h = 0.25 for the equation $y' = x^2 + y^2$, $y(1) = 2$.

6. The distance covered by an athlete for the 50 meter race is given in the following table:

Time(sec) :	0	1	2	3	4	5	6
Distance(m):	0	2.5	8.5	15.5	24.5	36.5	50

Determine the speed of the athlete at t = 3 sec correct to two decimals.

SECTION C

7. a) A group of boys and girls were given an intelligent test. The mean score, standard deviations and number in each group are as fellows:

	Boys	Girls
Mean	124	121
S.D.	12	10
N	18	14

Is the mean score of boys significantly different from that of girls?

b) Fit a Poisson distribution to the following data and test for its goodness-of-fit at 5% level of significance.

x:	0	1	2	3	4
f:	419	352	154	56	19

8. a) Show that the order of convergence of Newton-Raphson method is quadratic.

   b) Find the value of x for which y = *f* (x) is minimum in the given range of x, using the following data. Find also the minimum value of *f* (x).

x:	0	1	2	3	4	5	6
f (x):	769	668	541	389	401	462	495

9. a) Using Milne's method to find y(1.4) given dy/dx = x^2 (1 + y), y(l) = 1, y(l.1) = 1.233, y(1.2) = 1.548 and y(1.3) = 1.979.

   b) Using finite difference method, solve the equation y'' – 4y' + 4y = e^{3x} with conditions y(0) = 0, y(l) = 2, by taking n = 4.