Roll No. | | | | | | | | | | | | | Total No. of Pages : 02

Total No. of Questions : 09

B.Tech.(ME) (2011 Onwards) (Sem.–6)

STATISTICAL AND NUMERICAL METHODS IN ENGINEERING

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. Write briefly :

a) A class consists of 6 girls and 8 boys. If a committee of 3 is chosen at random from the class, find the probability that exactly 2 boys are selected.

b) A fair die is tossed 7 times. Find the probability of getting a 5 or 6 exactly 3 times.

c) A population consists of four numbers 2, 8, 14, 25. Find the population mean and the population standard deviation.

d) Find $P(-t_{0.025} < t < t_{0.01})$.

e) If the number p is correct to 3 significant digits, what is the maximum relative error?

f) State Newton-Gregory forward difference interpolation formula.

g) State Simpson's 1/3 rule.

h) Find the mean and mode of the set 2, 4, 7, 4, 9, 9, 5, 9.

i) Define a random variable.

j) Give two properties of a Binomial distribution.

SECTION-B

2. Find a positive root of $x^2 - 12 = 0$ using Newton-Raphson's method.

3. Compute $f'(x)$ and $f''(x)$ at $x = 16$ from the following table :

x	15	17	19	21	23	25
$f(x) = \sqrt{x}$	3.873	4.123	4.359	4.583	4.796	5.0

Compare with the exact values.

4. Using Taylor series expansion find $y(0.1)$ when $y' = x - y^2$, $y(0) = 0$.

5. On an average, 1.3 Gamma particles / millisecond come out of a radioactive substance. Determine the a) mean b) variance c) probability of more than one Gamma particle/millisecond come out of the substance.

6. Calculate the probability that $\overline{X}$ will be greater than 66.75 if a random sample of size 36 is taken from an infinite population having the mean $\mu = 63$ and variance $\sigma^2 = 81$.

SECTION-C

7. Determine the largest eigen value and the corresponding eigen vector of the matrix

$$A = \begin{bmatrix} 4 & 1 & 0 \\ 1 & 2 & 1 \\ 0 & 1 & 1 \end{bmatrix}.$$

8. Using Milne's predictor-corrector method evaluate the integral of $y' - 4y = 0$ at $x = 0.4$, 0.5 given that $y(0) = y_0 = 1$, $y(0.1) = y_1 = 1.492$, $y(0.2) = y_2 = 2.226$; $y(0.3) = y_3 = 3.320$.

9. Given the values of $u(x, y)$ on the boundary of the square of figure below, evaluate the function $u(x, y)$ satisfying the Laplace equation at the pivotal points of this figure by Jacobi's method.

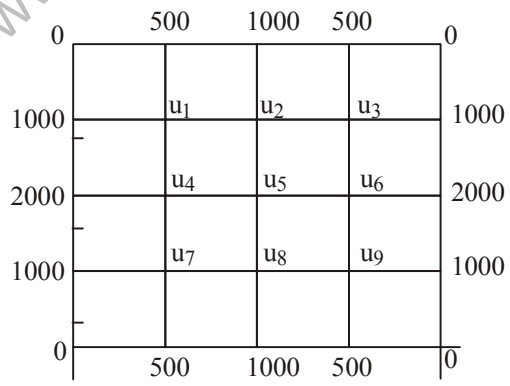

Fig.1