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Total No. of Questions: 09

Total No. of Pages: 02

B. Tech. (ME) (Sem. 6)
STATISTICAL AND NUMERICAL METHODS IN ENGINEERING
Subject Code: BTME-604
Paper ID: A2364

Time: 03 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) The mean of five items of an observation is 4 and the variance is 5.2. If three of the items are 1.2 and 6, then find the other two.
- b) If the probability of a bad reaction from a certain injection is 0.001. Determine the chances that out of 2,000 individuals more than two will get a bad reaction.
- c) Explain rounding and truncation errors.
- d) Differentiate bisection and Newton-Raphson methods.
- e) Prove that if λ is an eigenvalue of a matrix A, then $1/\lambda$ is an eigenvalue of A^{-1} .
- f) Write Newton's-forward interpolation formula.
- g) Explain normal sampling distributions.
- h) What are finite-difference methods.
- i) Write Newton-cots integration formula.
- j) Explain partial and complete pivoting.

SECTION B

2. A set of five similar coins is tossed 320 times and the results:

No. of heads	0	1	2	3	4	5
Frequency	6	27	72	112	71	32

Test the hypothesis that the data follows a binomial distribution.

3. Determine the roots of $x^4 + x^3 - 3x^2 - x + 5$ which lies between 2 and 3 correct to three decimal places.

4. Find an approximate value of $\int_1^2 \sqrt{x - \frac{1}{x}} dx$ by using (i) Trapezoidal rule, (ii) Simpson's 1/3 rule and (iii) Simpson's 3/8 rule.
5. Find the number of terms of the exponential series such that their sum gives the value of e^x correct to six decimal places at $x = 1$.
6. Find the first and second order derivatives of the function $f(x)$ at the point $x = 1.1$, if

x	1.0	1.2	1.5	1.6	1.8	2.0
$f(x)$	0.000	0.128	0.544	1.296	2.462	4.000

SECTION C

7. Apply Gauss-Seidal method to solve $5x + 2y + z = 12$, $x + 4y + 2z = 15$, $x + 2y + 5z = 20$ correct upto three decimal places using the initial approximations $x = y = z = 0$.
8. Using modified Euler's method and Runge-Kutta method of order 4, find $y(0.2)$ for $\frac{dy}{dx} = \frac{y-x}{y+x}$ with $y(0) = 1$ (Take $h = 0.1$).
9. In a distribution exactly normal, 7% of the items are under 35 and 79% are under 63. What is the mean and standard deviation of the distribution?