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Total No. of Pages : 02

Total No. of Questions : 09

B.Tech. (A.E.) (Sem.-5)

**NUMERICAL METHODS IN SIMULATION ENGINEERING**

Subject Code : AE-309

Paper ID : [A0717]

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) What is convergence ?
- b) What is meant by round-off error ?
- c) Write algorithm of bisection method for obtaining the roots of an equation.
- d) Define the dell operator.
- e) Give principle of least square curve fitting.
- f) Write the Simpson's (3/8) rule for numerical integration.
- g) Give Gaussian integration formula.
- h) Define the simulation.
- i) What is need for system modeling ?
- j) Give an example of Discrete Model.

**SECTION -B**

2. Evaluate the following integral using the trapezoidal rule and  $h = 0.1$

$$I = \int_1^{1.6} e^{x^2} dx$$

3. Using Runge-Kutta method of order 4. Find  $y$  for  $x = 0.1, 0.2, 0.3$ , given that

$$\frac{dy}{dx} = xy + y^2, y(0) = 1.$$

4. Using Gauss Elimination method, solve the system of algebraic equations

$$4x_1 + x_2 + x_3 = 4, x_1 + 4x_2 - 2x_3 = 4, 3x_1 + 2x_2 - 4x_3 = 6$$

5. How simulations help in time-to-market industry ?  
6. Briefly explain what is Monte-Carlo simulation.

**SECTION -C**

7. Using method of least square, fit a relation in form  $y = ab^x$  to the following data. Also estimate  $y$  (3.5).

|          |     |       |       |       |       |
|----------|-----|-------|-------|-------|-------|
| <b>x</b> | 2   | 3     | 4     | 5     | 6     |
| <b>y</b> | 144 | 172.8 | 207.8 | 248.8 | 298.5 |

8. Name any two simulation software packages and explain in details the capabilities of the software.  
9. What do you understand by the term “Model Validation and Verification” ? Explain.