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Total No. of Pages : 02

Total No. of Questions : 09

**B.Tech.(AE) (Sem.-5)**  
**NUMERICAL METHODS IN SIMULATION ENGINEERING**

Subject Code : AE-309

Paper ID : [A0717]

Time : 3 Hrs.

Max. Marks : 60

**INSTRUCTION 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 has to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students has to attempt any TWO questions.

**SECTION-A****Q1. Write briefly :**

- a) Difference between 'stochastic' and 'Random variables' and 'Discrete' and 'Continuous variables'.
- b) Give Gauss Interpolation formula.
- c) Discuss Quadrature formula.
- d) Find the difference of  $\sqrt{2.01} - \sqrt{2}$  correct to three digits.
- e) Explain SIMAN
- f) Write down Simulation Languages.
- g) Explain the rules of Round off.
- h) Derive Error in Linear Interpolation Formula.
- i) Find Value of  $\pi$
- j) Explain Relaxation Method.

**SECTION-B**

- Q2. Prove that the rate of convergence of Newton Raphson Method is Quadratic.
- Q3. Find the real root of the equation  $x^2 + 4 \sin x = 0$  correct to four places of decimal by using Newton- Raphson method.
- Q4. Solve by Gauss Elimination Method of the following:

$$6x+3y+2z = 6$$

$$6x+4y+3z = 0$$

$$20x+15y+12z = 0$$

- Q5. Write a note on Monte Carlo simulation.
- Q6. Solve  $dy/dx = y - x$ , by Runge Kutta's 2<sup>nd</sup> order given that  $y = 2$  when  $x = 0$ . Also find  $y(0.1)$ ,  $y(0.2)$ ,  $y(0.3)$ ,  $y(0.4)$ .

**SECTION-C**

- Q7. Use Picard's method to approximate the value of  $y$  when  $x = 0.1, 0.2, 0.3, 0.4, 0.5$  given that  $y = 1$  at  $x = 0$  and  $y = 1 + xy$ , correct to three decimal places
- Q8. Find a formula for the Probability distribution of the total number of heads obtained in four tosses of a balanced coin.
- Q9. a) Write a short note on Validation and Calibration of Simulation models.
- b) Discuss Analog vs. Simulation.