

Roll No.

Total No. of Pages : 02

Total No. of Questions : 09

B.Tech.(AE) (Sem.-5th)
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

1. Write briefly :

- (a) What do you mean by Errors and Significant digits?
- (b) Explain Relaxation Method.
- (c) Define Stochastic and Random Variables.
- (d) Write down Simulation languages.
- (e) Explain SIMAN.
- (f) Evaluate $\Delta \tan^{-1} ax$ and $\Delta^2 a^x$.
- (g) Discuss quadrature formulae.

(h) Evaluate $\int_0^6 \frac{dx}{1+x^2}$ by using Trapezoidal rule.

- (i) Write down Runge-Kutta method of fourth order.
- (j) Find value of Pi.

SECTION-B

2. (a) Show that Newton's method has a quadratic convergence.
 (b) Find the real root of the equation $x^3 - 4x - 9 = 0$ by the method of false position.
3. (a) Evaluate $\sqrt{30}$ by iteration method correct to four decimal places.
 (b) Write down differences between Newton's forward and Newton's backward difference formula.
4. Solve the given equation by Gauss-seidal method $20x + y - 2z = 17$, $3x + 20y - z = -18$, $2x - 3y + 20z = 25$.
5. Using Newton's divided difference formula, find $f(x)$ from the following data :

x	0	1	2	4	5	6
$f(x)$	1	14	15	5	6	19

6. Using Picard's method, find approximate values of y and z corresponding to $x = 0.1$, given that $y(0) = 2$, $z(0) = 1$ and $\frac{dy}{dx} = x + z$, $\frac{dz}{dx} = x - y^2$.

SECTION-C

7. Using Runge-Kutta method, solve $y'' = xy^2 - y^2$ for $x = 0.2$ correct to 4 decimal places. Initial conditions are $x = 0$, $y = 1$, $y' = 0$.
8. (a) Discuss one application of Monte Carlo methods
 (b) Discuss in brief about central tendency, dispersion and probability distribution functions.
9. (a) Find a formula for the probability distribution of the total number of heads obtained in four tosses of a balanced coin.
 (b) Discuss Analog vs. Computer Simulation.