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B. Tech. (Sem.- 5ᵗʰ)

NUMERICAL METHODS SIMULATION IN ENGINEERING

SUBJECT CODE : AE - 309

Paper ID : [A0717]

[Note : Please fill subject code and paper ID on OMR]

Time : 03 Hours   **Maximum Marks : 60**

Instruction to Candidates:

1)   Section - A is **Compulsory**.

2)   Attempt any **Four** questions from Section - B.

3)   Attempt any **Two** questions from Section - C.

Section - A

Q1)   *(10 × 2 = 20)*

a)   Evaluate $S = \sqrt{3} + \sqrt{5} + \sqrt{7}$ upto 4 significant digits. Also find its relative error.

b)   Let $u = \frac{5xy^2}{z^3}$.

Find $(\Delta u)_{max}$. at $\Delta x = \Delta y = \Delta z = 0.001$ & $x = y = z = 1$

c)   Give the algorithm of Graeffe's root squariy method.

d)   Find a cubic polynomial, if $y_0 = 1$, $y_1 = 0$, $y_2 = 1$ & $y_3 = 10$.

e)   Write down Newton's cotes formula.

f)   Find eigen values & eigen vector for the matrix

$$A = \begin{bmatrix} 1 & 4 \\ 3 & 2 \end{bmatrix}.$$

g)   Give algorithm of Escalator method.

h)   Find y (0.01) & y (0.02) using Euler's method, siren that

$y^1 = $ - y and y (0) = 1.

i)   Explain the term, "simulation – A management laboratory".

j)   Give 3 measures of central tendency.

Section - B

$(4 \times 5 = 20)$

Q2) Solve the system of equations using Gauss elimination method:

$x_1 + 3x_2 + 3x_3 + 4x_4 = 4$; $2x_1 + 6x_2 + 5x_3 - 4x_4 = 3$;

$3x_1 + 7x_2 + 2x_3 + 2x_4 = 12$; $2x_1 + 3x_2 + 5x_3 + 6x_4 = 5$.

Q3) Using divided difference table, fit a polynomial foc:

F(-1) = 3, f(0) = -6, f(3) = 39, f(6) = 822 & f(7) = 1611.

Q4) Using Newton Raphson method, find $\sqrt{29}$, correct up to 3 decimal places.

Q5) Evaluate $I = \int_0^1 x\,dx$ by gauss formula, correct up to 5 decimal places.

Q6) Write a note on Monte Carlo simulation.

Section - C

$(2 \times 10 = 20)$

Q7) a) Obtain the value of $e^{1.17}$ from the following table.

x	1.00	1.05	1.10	1.15	1.20	1.25	1.30
e^x	2.7183	2.8577	3.0042	3.1582	3.3201	3.4903	3.6693

b) For which value of x, y is maximum from the following table and find y also.

x	1.2	1.3	1.4	1.5	1.6
y	0.9320	0.9636	0.9855	0.9975	0.9996

Q8) a) Solve using Partition method;

2x + 3y + z = 9; x + 2y + 3z = 6; 3x + y + 2z = 8.

b) Using Runge kutta method, find y(0.2), if
$\frac{dy}{dx} = 3x + \frac{1}{2} y$ and y(0) = 1 (Take h = 0.1)

Q9) a) Discuss features of simulation language 'SIMSCRIPT'.

b) How the formulation of a dynamic system is carried out. Discuss by taking a case study.

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