UG Even Semester (CBCS) Exam., May—2017

COMPUTER SCIENCE

(2nd Semester)

Course No. : MCSCC–204

(Scientific Computation)

Full Marks : 70
Pass Marks : 28

Time : 3 hours

The figures in the margin indicate full marks for the questions

Answer **five** questions, taking **one** from each Unit

UNIT—I

1. *(a)* Calculate the absolute and relative errors in the result of the following arithmetic operations using four-digit mantissa : 2+2=4

(i) 87·26 + 31·42

(ii) 456·7 – 1·531

(b) Write down the algorithm of regula falsi method. 5

(c) Find the root correct to 3 decimal places with Newton-Raphson method for the equation $x^2 \quad 5x \quad 4 \quad 0$ with trial value 5. 5

2. *(a)* Perform the following floating point operations : 1×3=3

(i) $0 \; 3425E3 \quad 0 \; 6347E1$

(ii) $0 \; 6523(E \quad 1) \quad 0 \; 5621(E \quad 2)$

(iii) $0 \; 2332E2 \quad 0 \; 2111(E \quad 1)$

(b) What is the difference between bisection method and Newton-Raphson method? 2

(c) Find the smallest positive root of the equation $x^4 \quad x \quad 10 \quad 0$ correct to 2 decimal places. 5

(d) Derive the Newton-Raphson iteration formula. 4

UNIT—II

3. *(a)* Write the difference between Newton's divided difference table and Newton's forward difference table. 2

(b) Derive the Newton's divided difference interpolation formula. 7

(c) Find $f(3\ 2)$ using Newton-Gregory backward interpolation formula from the following data : 5

x	:	2·0	2·5	3·0	3·5	4·0
$f(x)$	:	246·2	409·3	537·2	636·3	715·9

4. (a) Find the Lagrange's interpolating polynomial of y from the following data : 5

x	:	0	1	3	4
y	:	5	6	50	105

(b) Use Newton divided difference formula to find the value of y at $x\ \ 4$ from the following data : 4

x	:	0	1	2	5
y	:	2	3	12	147

(c) Find the value of y at $x\ \ 1\ 5$ using Newton-Gregory forward interpolation formula from the following table : 5

x	:	1	2	3	4	5
y	:	41·66	34·46	28·28	22·94	18·32

UNIT—III

5. (a) Derive the normal equation for fitting a straight line using least square method. 7

(b) Find the inverse of the following matrix : 7

$$\begin{matrix} 8 & 4 & 0 \\ 4 & 8 & 4 \\ 0 & 4 & 8 \end{matrix}$$

6. (a) Write down the algorithm for Gauss-Jordan method. 4

(b) Using Gauss elimination method, solve the following system of equations : 6

$$\begin{matrix} x_1 & x_2 & 2x_3 & 3 \\ 4x_1 & 2x_2 & x_3 & 5 \\ 3x_1 & x_2 & 3x_3 & 8 \end{matrix}$$

(c) Solve the system of equations

$$\begin{matrix} 20x & y & 2z & 17 \\ 3x & 20y & z & 18 \\ 2x & 3y & 20z & 25 \end{matrix}$$

by Gauss-Seidel iterative method and perform the first three iterations. 4

UNIT—IV

7. (a) Derive Simpson's $\frac{1}{3}$rd formula for integration. 5

(b) Evaluate the integral

$$I \quad {}_0^1 \frac{dx}{1\quad x}$$

using trapezoidal rule having $h\quad \frac{1}{4}$. 3

(c) Find the value of f (3) and f (3) from the following data : 6

x	:	1	3	5	7	9
$f(x)$	:	85·3	74·5	67·0	60·5	54·3

8. *(a)* Find the value of f (0 6) and f (0 6) from the following data : 6

x	:	0·4	0·5	0·6	0·7	0·8
y	:	1·5836	1·7974	2·0442	2·3275	2·6510

(b) Evaluate the integral

$$I \quad \int_1^2 \frac{dx}{\sqrt{1 \quad x^2}}$$

by taking h $1/6$ using *(i)* Trapezoidal rule, *(ii)* Simpson's $\frac{1}{3}$rd rule and *(iii)* Simpson's $\frac{3}{8}$th rule. 2+3+3=8

Unit—V

9. *(a)* Solve by Taylor's series method of fourth order, the equation

$$\frac{dy}{dx} \quad x^2 \quad y^2, \; y(1) \quad 2$$

for y at x 1 2. 5

(b) Solve the equation

$$\frac{dy}{dx} \quad \frac{1}{x \quad y}, \; y(0) \quad 1$$

for y(0 1) and y(0 2) using Runge-Kutta method of fourth order. 9

10. *(a)* Find the values of y(4 1) using simple Euler's formula and modified Euler's formula with h 0 1, given that

$$\frac{dy}{dx} \quad \frac{2 \quad y^2}{5x}, \; y(4) \quad 1$$ 5

(b) Solve the equation

$$\frac{dy}{dx} \quad x \quad y^2, \; y(0) \quad 0$$

for y(1) using Milne's predictor-corrector method, given that y(0 2) 0 02, y(0 4) 0 0795, y(0 6) 0 1762. 9

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