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

COMPUTER SCIENCE

(2nd Semester)

Course No. : MCS–204 (C)

(Scientific Computation)

Full Marks : 75
Pass Marks : 30

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)* Perform the following floating-point operations : 1×4=4

(i) 0·3453 E2 + 0·5639 E3

(ii) 0·5863 E5 – 0·3322 E2

(iii) 0·1234 E2 × 0·2222 E–1

(iv) 0·3456 E–1 ÷ 0·8345 E–2

(b) Write down the algorithm for bisection method. 5

(c) Find the root of the equation x^3 5x 7 0, that lies between 2 and 3, correct to four decimal places, using method of false position. 6

2. *(a)* What do you mean by absolute error and relative error? Explain with example. 4

(b) Find the smallest positive root of the equation x^4 x 10 0, correct to 3 places of decimals, using bisection method. 6

(c) Find the root of the equation e^x 2x 1, correct to 4 places of decimal, using Newton-Raphson method. Take the initial value of root as 1. 5

UNIT—II

3. *(a)* Write the algorithm for Lagrange interpolation method. 6

(b) Find y at x 4 5 using Newton-Gregory forward interpolation for the following data : 6

x	3	4	5	6	7	8
y	0·205	0·240	0·259	0·262	0·250	0·224

(c) Generate the Newton divided difference table for the given data : 3

x	1	2	3	5
y	0	7	26	124

4. (a) Derive the Newton's divided difference interpolation polynomial. 7

(b) Use Newton-Gregory forward and backward formulas to find y at x 0 5 from the following data : 4+4=8

x	0·0	0·2	0·4	0·6	0·8	1·0
y	3·00	3·40	4·28	7·08	14·20	29·00

UNIT—III

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

(b) Fit a curve of the form $y \quad ax \quad bx^2$ to the given data : 8

x	1	2·5	4	6	8	10	12
y	2·8	15·3	38·8	85·8	152	235	340

6. (a) Derive normal equation of the form $y \quad ax^b$. 7

(b) Fit a parabola to the following data using the method of least square : 8

x	1·0	1·2	1·4	1·6	1·8	2·0
y	0·98	1·40	2·86	2·55	2·28	3·20

UNIT—IV

7. (a) Derive Simpson's 3/8th formula for integration. 5

(b) Evaluate the integral

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

taking $h \quad \frac{1}{6}$ using Simpson's $\frac{1}{3}$rd rule, and trapezoidal rule. 3+2=5

(c) Find the value of f (0 5) from the following data : 5

x	0·1	0·3	0·5	0·7	0·9	1·1	1·3
$f(x)$	0·003	0·067	0·148	0·248	0·370	0·518	0·697

8. *(a)* Evaluate the integral

$$I = \int_0^1 \frac{dx}{1+x}$$

using trapezoidal rule taking $h = \frac{1}{4}$. 3

(b) Find the value of $f'(3)$ and $f''(1)$ from the following data : 6

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

(c) Find the value of $f'(0.5)$ and $f''(0.7)$ 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

UNIT—V

9. *(a)* Use Taylor's expansion (up to x^3) to solve the differential equation

$$\frac{dy}{dx} = x + y + xy, \; y(0) = 1$$

for $x = 0.25$ and 0·5. 3×2=6

(b) Solve the equation

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

for $y(0.1)$ and $y(0.2)$ using Runge-Kutta method of fourth order. 9

10. *(a)* Solve the following equation by Euler's modified method for $y(1)$ using $h = 0.5$:

$$y' = x^2 + y^2, \; y(0) = 2$$ 6

(b) Solve the equation $\frac{dy}{dx} = x + y^2, y(0) = 0$ 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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