Reg. No. :

Question Paper Code : 75537

5 Year M.Sc. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2013.

Third Semester

Software Engineering

XCS 232/ 10677 SW 302 — NUMERICAL METHODS

(Common to 5 Year M.Sc. Information Technology/M.Sc. Computer Technology)

(Regulation 2003/2010)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is the demerits of Bisection method?

2. What is the condition for applying the fixed point iteration method to find the real root of the equation $x = f(x)$?

3. Define diagonally dominant systems.

4. Why Gauss-Seidal is a better method than Jacobi's iterative method?

5. State any two properties of divided differences.

6. What is the disadvantage in practice in applying Lagrange's interpolation formula?

7. Write the order of error in using Simpson's one-third and Trapezoidal rules.

8. Write down the expressions for $\frac{dy}{dx}$ at $x = x_n$ using Newton's backward difference formula.

9. Solve $\frac{dy}{dx} = x + y; y(0) = 1$, to find $y(0.1)$ using Euler's method.

10. Write the finite difference approximations for $\frac{dy}{dx}$.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Solve $x^3 - 9x + 1 = 0$ for the root between $x = 2$ and $x = 4$ by the bisection method. (8)

(ii) Solve by Newton's method the equation $x \log_{10}^{x} = 1.2$. (8)

Or

(b) (i) Find the positive root of $x^3 - 2x - 5 = 0$ by the method of false position. (8)

(ii) Find a real root of the equation $x^3 + x^2 - 100 = 0$ using fixed point iterative method. (8)

12. (a) (i) Solve the following system of equations using Gauss-Seidal method $4x + 2y + z = 14, x + 5y - z = 10, x + y + 8z = 20$. (8)

(ii) Solve the following system of equations using triangularisation method $8x - 3y + 2z = 20, 4x + 11y - z = 33, 6x + 3y + 12z = 36$. (8)

Or

(b) (i) Solve the following system of equations using Gauss-elimination method $10x - 2y + 3z = 23, 2x + 10y - 5z = -33, 3x - 4y + 10z = 41$. (8)

(ii) Solve the following system of equations using Jacobi iteration method $5x - 2y + z = -4, x + 6y - 2z = -1, 3x + y + 5z = 13$. (8)

13. (a) (i) Find f (8) by Newton's divided difference formula for the following data (8)

x	4	5	7	10	11	13
$f(x)$	48	100	294	900	1210	2038

(ii) Construct the difference table from the folllwing data

x	50	51	52	53	54
$f(x)$	39.1961	39.7981	40.3942	40.9843	41.5687

and also obtain $f(50.5)$ using Newton's forward difference formula. (8)

Or

(b) (i) Use Lagrange's formula to fit a polynomial to the data (8)

x	-1	0	2	3
$f(x)$	-8	3	1	12

and hence find $f(1)$

(ii) Use Stirling's formula to find $\log_{10}^{332.5}$ using the following table of $y = \log_{10}^{x}$ (8)

x	310	320	330	340	350	360
$\log_{10}^{x}$	2.4914	2.5052	2.5185	2.5315	2.5441	2.5563

14. (a) (i) From the following table of values of x and y obtain $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ for $x = 1.2$. (8)

x	1.0	1.2	1.4	1.6	1.8	2.0	2.2
y	2.7183	3.3201	4.0552	4.9530	6.0496	7.3891	9.0250

(ii) By dividing the range into ten equal parts, evaluate $\int_0^{\pi} \sin x \, dx$ by using Simpson's one-third rule. Is it possible to evaluate the same by Simpson's three-eighth rule? (8)

Or

(b) (i) Find $f'(0.25)$ and $f''(0.25)$ from the following data using the method based on divided differences. (8)

x	0.15	0.21	0.23	0.27	0.32	0.35
$f(x)$	0.1761	0.3222	0.3617	0.4314	0.5051	0.5441

(ii) By dividing the range into ten equal parts, evaluate $\int_1^2 \frac{dx}{x}$ by using Trapezoidal rule and hence deduce the value of $\log_e^2$. (8)

15. (a) (i) Solve $\frac{dy}{dx} = x - y^2$ by Taylor Series method to calculate y at $x = 0.4$ in two steps given that $y(0) = 1$. (8)

(ii) Using the finite difference method, solve $\frac{d^2y}{dx^2} + y = x$ subject to the boundary conditions $y = (0) = 0$ and $y(1) = 2$, by taking $h = 0.25$. (8)

Or

(b) (i) Using R-K method of order four, calculate $y(0.1)$ and $y(0.2)$ given that $\frac{dy}{dx} = 1 + \frac{2xy}{1 + x^2}, y(0) = 0$. (8)

(ii) Using Euler's method, find the solution of the initial value problem $\frac{dy}{dx} = \log(x + y)$ given that $y(0 = 2)$ at $x = 0.2, 04, 0.6$. (8)
