Reg. No. | | | | | | | | | | | | |

Question Paper Code : 27389

5 Year M.Sc. DEGREE EXAMINATION, MAY/JUNE 2016

Third Semester

Computer Technology

XCS 232/10677SW 302 – NUMERICAL METHODS

(Common to 5 Year M.Sc. Information Technology and 5 Year M.Sc. Software Engineering)

(Regulations 2003/2010)

Time : Three Hours **Maximum : 100 Marks**

Answer ALL questions.

PART – A (10 × 2 = 20 Marks)

1. State the condition for the convergence of the roots of the equation $x = \phi(x)$ by iterative method.

2. State the formula for finding an approximate root of the equation $f(x) = 0$ by method of False Position.

3. Solve using Gauss method the equations $3x + 5y = 8$, $4x - 7y = -3$.

4. Compare Jacobi and Gauss-Seidal methods.

5. State Newton's divided difference interpolation formula.

6. State sterling's formula of interpolation.

7. Write the formula for $\frac{dy}{dx}$ at $x = x_0$ using forward difference operator.

8. What is the order of error in trapezoidal formula ?

9. What is the geometrical meaning of Euler's algorithm ?

10. Given $y' = x + y$, $y(0) = 1$, find $y(0.1)$ by Taylor series method.

PART – B (5 × 16 = 80 Marks)

11. (a) (i) Find the positive root of $x - \cos x = 0$ by bisection method. **(8)**

(ii) Solve the equation $x^3 + x^2 - 1 = 0$ for the positive root by iteration method. **(8)**

OR

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

(ii) Using Newton's method, find the root between 0 and 1 of $x^3 = 6x - 4$ correct to five decimal places. **(8)**

12. (a) (i) Solve by triangularisation method, the system of equations $2x + y + 3z = 13$, $3x + y + 4z = 17$, $x + 5y + z = 14$. **(8)**

(ii) Using Gauss-Seidal method, solve the following equations with starting vector $(1, 1, 1)^T$:

$x + y + 8z = 20$, $4x + 2y + z = 14$, $x + 5y - z = 10$. (Do three iterations) **(8)**

OR

(b) (i) Solve the system of equations by Gauss-Jacobi method, with starting vector $(1, 1, 1)^T$.

$x + 6y - 2z = -1$, $3x + y + 5z = 13$ and $5x - 2y + z = -4$.

(Do three iterations) **(8)**

(ii) By Gauss-Jordan method, solve the equations.

$2x + 3y - z = 5$, $2x - 3y + 2z = 2$, $4x + 4y - 3z = 3$ **(8)**

13. (a) (i) Use Lagrange's formula to fit a polynomial to the data

x :	0	2	3
y :	3	1	12

and hence find y at $x = 1$. **(8)**

(ii) The following data are taken from the steam table

Temp °C :	140	150	160	170	180
Pressure kgf/cm^2 :	3.685	4.854	6.302	8.076	10.225

Find the pressure at temperature t = 175 °C. **(8)**

OR

(b) (i) Using Newton's divided difference formula, find the value of f(2) from the following table : **(8)**

x :	4	5	7	10	11
f(x) :	48	100	294	900	1210

(ii) Find a polynomial which takes the values by using Newton-Gregory forward interpolation formula :

x :	2	3	4	5	6	7
y :	4	7	11	16	22	29

and hence find the value of f(2.5) **(8)**

14. (a) (i) Find the first two derivatives at $x = 1.5$, $x = 4$ from the data given below : **(8)**

x :	1.5	2	2.5	3	3.5	4
y :	3.375	7	13.625	24	38.875	59

(ii) Calculate $\int_0^{\pi} \sin^3 x \, dx$, h = $\pi/6$, Simpson's 1/3 rule and Simpson's 3/8 rule. **(8)**

OR

(b) (i) A curve passes through the points (1, 2), (1.5, 2.4), (2, 2.7), (2.5, 2.8), (3, 3), (3.5, 2.6) and (4, 2.1). Find the area bounded by the curve, the x-axis and $x = 1$, $x = 4$. **(8)**

(ii) Determine f' (4) from the following data by using Newton's divided formula. **(8)**

x :	1	2	4	8	10
y :	0	1	5	21	27

15. (a) Use 4^{th} order Runge-Kutta method to estimate y(0.4) when $y'(x) = x^2 + y^2$ with y(0) = 0. **(16)**

OR

(b) Given the differential equation $\frac{d^2y}{dx^2} = e^{x^2}$ with y(0) = 0, y(1) = 0. Estimate the values of y(x) at x = 0.25, 0.5, and 0.75 using finite difference method. **(16)**
