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**Question Paper Code : 27281**

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

**Third Semester**

**Software Engineering**

**EMA 004 – NUMERICAL METHODS**

**(Common to 5 Year M.Sc. Software Systems)**

**(Regulations 2010)**

**Time : Three Hours**

**Maximum : 100 Marks**

**Answer ALL questions.**

**PART – A (10 × 2 = 20 Marks)**

1. State the criterion for convergence in Newton's method.
2. What is the order of convergence for the method of False Position ?
3. State the condition for the convergence of Gauss-Seidel method.
4. Distinguish between Gauss elimination method and Gauss Jordan method.
5. Write down the Newton's divided difference formula.
6. State Stirling's formula of interpolaiton.
7. Write Newton's divided difference interpolation formula for first derivative of the function  $y = f(x)$ .
8. What is the order of error in Simpson's one-third rule ?
9. Find  $y(0, 1)$  given  $y' = -y$ ,  $y(0) = 1$  by Euler's method.
10. What are the advantages of Runge-Kutta method over Taylor's 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  $x^3 - 4x + 1 = 0$  by Regula Falsi method. (8)

**OR**

- (b) (i) Find the square root of 2 by fixed point iterative method. (8)  
(ii) Find by Newton's method, the positive root  $4x - e^x = 0$  that lies between 2 and 3. (8)

12. (a) (i) Solve the following system of equations by Gauss Elimination method :

$$2x + 3y - z = 5$$

$$4x + 4y - 3z = 3$$

$$2x - 3y + 2z = 2$$

(8)

- (ii) Solve :  $x + y + z = 1$

$$4x + 3y - z = 6$$

$$3x + 5y + 3z = 4$$

by triangularization method.

(8)

**OR**

- (b) (i) Solve  $x + 2y + z = 3$

$$2x + 3y + 3z = 10$$

$$3x - y + 2z = 13$$

By Gauss Jordan method.

(8)

- (ii) Solve the following system of equation by Gauss Seidel method :

$$10x - 5y - 2z = 3$$

$$4z - 10y + 3z = -3$$

$$x + 6y + 10z = -3$$

(8)

13. (a) (i) Construct a polynomial for the data given below by Newton's Forward Interpolation : Find also  $y$  when  $x = 5$ . (8)

$x$	4	6	8	10
$y$	1	3	8	16

- (ii) Using Lagrange's interpolation find  $y(1)$ . (8)

$x$	-1	0	2	3
$y$	-8	3	1	12

OR

- (b) (i) From the following table find  $f(6)$  using Newton's divided difference formula : (8)

$x$	1	2	7	8
$y$	1	5	5	4

- (ii) Find  $\tan(0.26)$  from the following values of  $\tan x$  by Newton's backward difference : (8)

$x$	0.10	0.15	0.20	0.25	0.30
$\tan x$	0.1003	0.1511	0.2027	0.2553	0.3093

14. (a) (i) A slider in a machine moves along a fixed straight rod. Its distance  $x$  cm. along the rod is given below for various values of the time  $t$  seconds. Find the velocity of the slider and its acceleration when  $t = 0.3$  second. (8)

$t$	0	0.1	0.2	0.3	0.4	0.5	0.6
$x$	30.13	31.62	32.87	33.64	33.95	33.81	33.24

- (ii) Evaluate :  $\int_0^1 \frac{1}{1+x^2} dx$  by Trapezoidal rule. (8)

OR

- (b) (i) Find the first derivative of  $x^{1/3}$  at  $x = 50$  given the table below : (8)

$x$	50	51	52	53	54	55	56
$x^{1/3}$	3.6840	3.7084	3.7325	3.7563	3.7798	3.8030	3.8259

- (ii) Evaluate :  $\int_0^1 e^x dx$  by Simpson's 1/3<sup>rd</sup> rule. (8)

15. (a) (i) Solve :  $\frac{dy}{dx} = x + y$ ,  $y(1) = 0$  Find  $y(1, 1)$  by Taylor's series method and compare with exact solution. (8)

- (ii) Apply Runge-Kutta method of fourth order to calculate  $y(0, 1)$  given  $\frac{dy}{dx} = x + y$ ,  $y(0) = 1$ . (8)

OR

- (b) Solve the boundary value problem  $y'' + xy' + y = 3x^2 + 2$ ,  $y(1) = 1$  by finite difference method. (8)