

[6]

4. Employ Taylor's method to obtain approximate value of y at $x = 0.2$ for the differential equation $dy/dx = 2y + 3e^x$, $y(0) = 0$. Compare the numerical solution obtained with the exact solution.

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**B. E. (Fourth Semester) Examination,
April-May 2016**

(Old Scheme)

(CSE, IT)

COMPUTATIONAL MATHEMATICS

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : Question 1 is compulsory of each unit. And attempt any two from Question 2, 3, 4 of each unit.

Unit-I

1. Write the general formula for Secant Method.

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[2]

2. Solve $x^4 - 5x^3 + 20x^2 - 40x + 60 = 0$ given that all the roots of $f(x) = 0$ are complex, by using Lin Bairstow method starting with $P_0 = -4, q_0 = 8$. 7
3. Find the real positive root of $3x - \cos x - 1 = 0$ by Newton's method correct to 6 decimal places. 7
4. Use synthetic division and perform two iterations of the Birge-Vieta method to find the smallest positive root of the equation $x^4 - 3x^3 + 3x^2 - 3x + 2 = 0$. (Take $P_0 = 0.5$). 7

Unit-II

1. Write the difference between Direct Method and Iterative Method. 2
2. Solve the equations, by Gauss-Jordan Method : 7
- $$10x - 7y + 3z + 5u = 6$$
- $$-6x + 8y - z - 4u = 5$$
- $$3x + y + 4z + 11u = 2$$
- $$5x - 9y - 2z + 4u = 7$$

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3. Solve the equations : 7
- $$10x - 2y - 3z = 205$$
- $$-2x + 10y - 2z = 154$$
- $$-2x - y + 10z = 120$$

By Relaxation Method.

4. Solve by Jacobi's iteration methods the equations : 7
- $$20x + y - 2z = 17; 3x + 20y - z = -18;$$
- $$2x - 3y + 20z = 25$$

Unit-III

1. What is the value of $\Delta \tan^{-1} x$? 2
2. Find the cubic polynomial which takes the following values : 7
- | | | | | | |
|--------|---|---|---|---|----|
| x | : | 0 | 1 | 2 | 3 |
| $f(x)$ | : | 1 | 2 | 1 | 10 |
- Hence or otherwise evaluate $f(4)$.
3. Apply Bessel's formula to obtain y_{25} given $y_{20} = 2854, y_{24} = 3162, y_{28} = 3544, y_{32} = 3992$. 7

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4. Determine $f(x)$ as a polynomial in x for the following data :

x	:	-4	-1	0	2	5
$f(x)$:	1245	33	5	9	1335

Unit-IV

1. What is Quadrature? 7
2. 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 : 7

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

3. A solid of revolution is formed by rotating about the x -axis, the area between the x -axis, the lines $x = 0$ and $x = 1$ and a curve through the points with the following 10 ordinates :

t	:	0.00	0.25	0.50	0.75	1.00
x	:	1.0000	0.9896	0.9589	0.9089	0.8415

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Estimate the volume of the solid formed using Simpson's rule.

4. Evaluate

$\int_0^6 \frac{dx}{1+x^2}$

by

- (i) Trapezoidal rule
- (ii) Simpson's rule
- (iii) Weddle's rule. Also check up the results by actual integration. 7

Unit-V

1. Write formula for Runge-Kutta method of 4th order. 2
2. Given $dy/dx = x^2(1+y)$ and $y(1) = 1$, $y(1.1) = 1.233$, $y(1.2) = 1.548$, $y(1.3) = 1.979$ evaluate $y(1.4)$ by Adams-Bashforth method. 7
3. Given $dy/dx = y - x/y + x$ with initial conditions $y = 1$ at $x = 0$; find y for $x = 0.1$ by Euler's method. 7