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Roll No. :

333451(14)

B. E. (Fourth Semester) Examination, 2020
APR-MAY 2022
(New Scheme)

(IT Engg. Branch)

COMPUTATIONAL MATHEMATICS

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : Attempt all questions. Part (a) from each question is compulsory. Attempt any two parts from (b), (c) and (d) of each question.

Unit-I

1. (a) The order of convergence in Newton-Raphson methods is 2
- (b) Using Newton's iterative method find the real root of $x \log_{10} x = 1.2$ correct to five decimal places. 7

[2]

- (c) Use the method of false position, to find the fourth root of 32 correct to three decimal place. 7
- (d) Find the root of the equation $xe^x = \cos x$ using the secant method correct to four decimal places. 7

Unit-II

2. (a) The condition for the convergence of Gauss-Seidal matrix in that in each equation of the system 2

(b) Apply Gauss-Jordan method to solve the equations :

$$x + y + z = 9$$

$$2x - 3y + 4z = 13$$

$$3x + 4y + 5z = 40$$

7

(c) Apply Gauss-Seidal iterative method to solve the equation :

$$20x + y - 2z = 17$$

$$3x + 20y - z = -18$$

$$2x - 3y + 20z = 25$$

7

(d) Solve by Relaxation method, the equation

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$$9x - 2y + z = 50$$

$$x + 5y - 3z = 18$$

$$-2x + 2y + 7z = 19$$

7

Unit-III

3. (a) Evaluate

$$\Delta^{10} [(1-ax)(1-bx^2)(1-cx^3)(1-dx^4)] = 2$$

(b) The table gives the distance in nautical miles of the visible horizon for the given heights in feet above the earth's surface : 7

x = height : 100 150 200 250 300 350 400

y = distance : 10.63 13.03 15.04 16.81 18.42 19.90 21.27

find the values of y when

(i) $x = 160$ ft

(ii) $x = 410$ ft

(c) Apply Bessels formula to obtain y_{25} given

$$y_{20} = 2854 \quad y_{24} = 3162 \quad y_{28} = 3544 \quad y_{32} = 3992$$

7

[4]

(d) Given the values

x	5	7	11	13	17
$f(x)$	150	392	1452	2366	5202

evaluate $f(9)$, using Newton's divide difference formula.

7

Unit-IV

4. (a) Write Weddle's Rule.

2

(b) Given that

x	1.0	1.1	1.2	1.3	1.4	1.5	1.6
y	7.989	8.403	8.781	9.129	9.451	9.750	10.031

Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at (a) $x = 1.1$

(b) $x = 1.6$

7

(c) Evaluate the integral $I = \int_4^{5.2} \log_e x \, dx$ using Trapezoidal and Simpson's Rules.

7

(d) The velocity V (km/min) of a moped which starts from rest, is given at fixed intervals of time t (min) as follows :

7

[5]

t	2	4	6	8	10	12	14	16	18	20
v	10	18	25	29	32	20	11	5	2	0

Estimate approximately the distance covered in 20 minutes.

7

Unit-V

5. (a) Which of the following is a step by step method?

2

- (i) Taylors
- (ii) Adams - Bashforth
- (iii) Picard's
- (iv) None

(b) Find the value of y for $x = 0.1$ by Picard's method.

Given that $\frac{dy}{dx} = \frac{y-x}{y+x}$ $y(0) = 1$.

7

(c) Apply Runge-Kutta method to find approximate value of y for $x = 0.2$, in steps of 0.1 if

$\frac{dy}{dx} = x + y^2$ given that $y = 1$ when $x = 0$.

7

[6]

(d) Using Milne's method find $y(4.5)$ given

$$5xy' + y^2 - 2 = 0 \text{ given } y(4) = 1, y(4.1) = 1.0049,$$

$$y(4.2) = 1.0097, y(4.3) = 1.0143, y(4.4) = 1.0187. \quad 7$$