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B. E. (Fourth Semester) Examination, April–May 2021

(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) Write the general formula at Newton-Raphson method.   2

   (b) Find the root of the equation $x e^x = \cos x$ using the secant method, correct to four decimal places.   7

(c) Find the real root of the equation $x \log_{10} x - 1 \cdot 2 = 0$ by the regula falsi method correct to four decimal places. 7

(d) Perform two iterations by Birge-Vieta method and find the smallest postive root of the equation,

$$x^4 - 3x^3 + 3x^2 - 3x + 3 = 0 \cdot$$ 7

Unit-II

2. (a) Define diagonally dominant system. 2

(b) Apply Crout's (factorization) method to solve the equations : 7

$$3x + 2y + 7z = 4$$
$$2x + 3y + z = 5$$
$$3x + 4y + z = 7$$

(c) Solve the following system of equations using Gauss Seidal iteration method : 7

$$6x + 15y + 2z = 72$$
$$x + y + 54z = 110$$
$$27x + 6y - z = 85$$

(d) Solve the following equations using Relaxation method : 7

$$5x - y - z = 3$$
$$-x + 10y - 2z = 7$$
$$-x - y + 10z = 8$$

Unit-III

3. (a) Write stirling's formula. 2

(b) Using Newton's farward interpolation formula find $y(79)$ from the following value : 7

$$y(75) = 246, \ y(80) = 202$$
$$y(85) = 118, \ y(90) = 40$$

(c) Apply stirling's formula to find $y(25)$ for the following data : 7

x	20	24	28	32
y	2854	3162	3544	3992

(d) Using Newton's divided difference formula evaluate $f(8)$ given that. 7

x	4	5	7	10	11	13
$f(x)$	48	100	294	900	1210	2028

Unit-IV

4. (a) Write the Newton's Cotes quadrature formula.　2

(b) The population of a certain town is shown in the following table :　7

Year (x)	:	1931	1941	1951	1961	1971
Population (y)	:	40·62	60·80	79·95	103·56	132·65

Find the rate of growth of the population in 1961.

(c) Evaluate $\int_0^{10} \frac{dx}{1+x^2}$ by using :　7

   (i) Trapezoidal rule

   (ii) Simpson's one third rule

(d) Evaluate $\int_0^{\pi/2} \sin x \, dx$ by Simpson's 1/3 rule dividing the range into six equal parts.　7

Unit-V

5. (a) Write the formula at Runge-Kutta 4th order method. 2

(b) Using Picard's method solve $\frac{dy}{dx} = 1 + xy$, with

   $y(0) = 2$, find $y(0·1), y(0·2)$ and $y(0·3)$.　7

(c) Using Runge-Kutta method of 4th order find $y(0·1), y(0·2)$ and $y(0·3)$ given that

   $$\frac{dy}{dx} = 1 + xy, \, y(0) = 2$$
   　7

(d) Given $\frac{dy}{dx} = \frac{1}{x+y}, \, y(0) = 2$

   if $y(0·2) = 2·09, y(0·4) = 2·17$ and

   $y(0·6) = 2·24$ find $y(0·8)$ using Milne's method.　7