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

(CSE Branch)

COMPUTATIONAL MATHEMATICS

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : *Attempt all questions. Part (a) of each question is compulsory and carries 2 marks. Attempt any* **two** *parts from (b), (c) and (d) which carry 7 marks each.*

Unit - I

1. (a) Explain intermediate value property. 2

(b) Find a real root of the equation $x \log_{10} x = 1{\cdot}2$ by using Regula-Falsi method correct to three decimal places. 7

(c) Find the Newton-Raphson method, the real root of the equation $3x = \cos x + 1$ correct to three decimal places. 7

(d) Find a real root of the equation

$$x^4 - 3x^3 + 3x^2 - 3x + 2 = 0$$

by Birge-Vieta method correct to three decimal places using the initial approximation $p_0 = 0{\cdot}5$. 7

Unit - II

2. (a) Apply Gauss elimination method to solve the equations :

$$x + 4y - z = -5;$$

$$x + y - 6z = -12;$$

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

(b) Solve the following system of the equations by the method of Crout's triangulization :

$$x + 5y + z = 14;$$

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

$$3x + y + 4z = 17$$ 7

(c) Solve the following system of equations :

$$8x - 3y + 2z = 20;$$

$$4x + 11y - z = 33;$$

$$6x + 3y + 12z = 35$$

by Gauss-Seidal method. 7

(d) Use relaxation method to solve the system :

$$8x + y + z + w = 14$$

$$2x + 10y + 3z + w = -8$$

$$x - 2y - 20z + 3w = 111$$

$$3x + 2y + 2z + 19w = 53$$ 7

Unit - III

3. (a) Find the cubic polynomial which takes the following values :

x	0	1	2	3
$f(x)$	1	2	1	10

Hence or otherwise evaluate $f(4)$. 2

(b) Use Stirling formula to evaluate $f(1{\cdot}22)$, given :

x	:	1·0	1·1	1·2	1·3	1·4	
$f(x)$	:	0·841	0·891	0·932	0·963	0·985	7

(c) Use Lagrange's formula, express the function :

$$\frac{x^2+6x-1}{(x^2-1)(x-4)(x-6)}$$

as a sum of partial fractions. 7

(d) Using Newton's divided difference formula, find the mising value from the table :

x	:	1	2	4	5	6	
$f(x)$	:	14	15	5	–	9	7

Unit - IV

4. (a) Evaluate

$$\int_0^2 e^{-x^2}\,dx,$$

using Simpson's rule. 2

(b) A solid of revolution is formed by rotating about the x-axis, the areas between the x-axis, the line $x = 0$ and $x = 1$ and a curve through the points with the following co-ordinates :

x	y
0·00	1·000
0·25	0·9896
0·50	0·9589
0·75	0·9089
1·00	0·8415

Estimate the volume of the solid forward using Simpson's rule. 7

(c) Given that :

x	y
1·0	7·989
1·1	8·403
1·2	9·781
1·3	9·129
1·4	9·451
1·5	9·700
1·6	10·031

Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at :

(i) $x = 1·1$

(ii) $x = 1·6$ 7

(d) 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 = 0·03 second. 7

$t = 0$	$x = 0$
0	30·13
0·1	31·62
0·3	33·64
0·4	33·95
0·5	33·81
0·6	33·24

Unit - V

5. (a) Write down an expression for Milne's Predictor and Corrector method for solving the differential equation. 2

(b) Using Runge-Kutta method of order 4, find y for $x = 0·1$ and $x = 0·2$, given that

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

(c) Solve that initial value problem :

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

for $x = 0·4$, by using Milne's method, when it is given that :

x	:	0·1	0·2	0·3	
y	:	1·105	1·223	1·355	7

(d) Using Adams-Bashforth method obtain the solution of :

$$\frac{dy}{dx} = x - y^2 \text{ at } x = 0·8$$

given the values :

x	:	0	0·2	0·4	0·6	
y	:	0	0·0200	0·0795	0·1762	7