BACHELOR OF TECHNOLOGY (C.B.C.S.) (2020 COURSE)
B.Tech.Sem - III ELECTRICAL : : SUMMER - 2022
SUBJECT : COMPUTATIONAL ALGORITHMS

Day : Thursday
Date : 2/6/2022

S-24543-2022

Time : 02:30 PM-05:30 PM
Max. Marks : 60

N.B.:

1) All questions are **COMPULSORY**.
2) Figures to the right indicate **FULL** marks.
3) Use of non-programmable **CALCULATOR** is allowed.
4) Draw neat and labeled diagram **WHEREVER** necessary.
5) Assume suitable data if necessary.

Q.1 **a)** Perform operation on following numbers using floating point algebra: **[05]**

i) 3.1897 E10 + 1.18631 E12
ii) 3.1897 E10 × 0.2383 E10
iii) 5.2869 E5 ÷ 0.2386 E2

b) Explain various operators in MATLAB with suitable examples. **[05]**

OR

Q.1 **a)** What are different types of errors? Explain generalized error formula. **[05]**

b) Write short notes on the following in MATLAB context: **[05]**
i) Data types **ii)** Control statements

Q.2 **a)** Solve the following equation by using Bisection method. Consider appropriate interval. $f(x) = x^3 - 29 = 0$. Solve only 5 iterations. **[05]**

b) Fit a second degree parabola to the following data for the equation $y = ax^2 + bx + c$. **[05]**

x	0	1	2
y	6	9	13

OR

Q.2 **a)** Use Newton-Raphson method to obtain root up to 4 decimal places for the function: $\sin(x) = 1 - x$. **[05]**

b) Use Secant method to find root of $f(x) = x\log_{10}(x) - 1.9 = 0$ at the end of 3rd iteration. **[05]**

Q.3 **a)** If $f(50) = 39.1961$, $f(51) = 39.7981$, $f(52) = 40.3942$, $f(53) = 40.9843$, $f(54) = 41.5687$, then obtain $f(53.5)$ using Newton's backward interpolation method. **[05]**

b) Use Lagrange's interpolation formula to find value of y when $x = 1.5$ for given data: **[05]**

x	1	3	6	8
y	2.3	4.9	7.3	9.8

OR

Q.3 **a)** Compute $f(1.5)$ for following data using Newton's divided difference method. **[05]**

x	0	1	2	5
$f(x)$	2	3	12	147

P.T.O.

b) The current flowing through the inductance as a function of time is given below. Determine the voltage drop in an inductance of 4H at $t = 0.3$. **[05]**

time, t	0	0.1	0.2	0.3	0.5	0.7
current, i	0	0.15	0.3	0.55	0.8	1.9

Q.4 a) Solve the equation: $\frac{dy}{dx} = \frac{1}{x-y}$, $y(0)=1$ for $y(0.1)$ and $y(0.2)$ by using Runge-Kutta method of 4th order. **[05]**

b) Evaluate $\int_0^{\pi} x.\sin(x)dx$ using trapezoidal rule by taking 13 ordinates. **[05]**

OR

Q.4 a) Evaluate the integral $\int_0^{\pi}(4+2\sin x)\,dx$ using Simpson's 3/8 rule where n = 5. **[05]**

Compute percentage relative error.

b) Use modified Euler's method to solve $\frac{dy}{dx} = x^2 + y$ with condition $y(0) = 1$. **[05]**

Find the value of y at $x = 0.1$.

Q.5 a) Use Gauss Elimination method to solve the following equations. Use Partial pivoting. **[05]**

$$x_1 + 20x_2 + x_3 = 22$$
$$-x_1 - x_2 + 20x_3 = 18$$
$$20x_1 + x_2 - x_3 = 20$$

b) Solve the following equations by using Gauss-Seidel method current up to three significant digits. **[05]**

$$x_1 + 10x_2 - 4x_3 = 6$$
$$2x_1 - 4x_2 + 10x_3 = -15$$
$$9x_1 + 2x_2 + 4x_3 = 20$$

OR

Q.5 a) Use Gauss Jordan method to compute inverse of matrix: **[05]**

$$A = \begin{bmatrix} 3 & -0.1 & -0.2 \\ 0.1 & 7 & -0.3 \\ 0.3 & -0.2 & 10 \end{bmatrix}$$

b) Using Jacobi's iteration method solve the following system of equations. **[05]**

$$2x_1 + 12x_2 + x_3 - 4x_4 = 13$$
$$13x_1 + 2x_2 - 3x_3 + x_4 = 18$$
$$2x_1 + x_2 - 3x_3 + 9x_4 = 31$$
$$3x_1 - 4x_2 + 10x_3 + x_4 = 29$$

Q.6 a) What do you mean by Hypothesis testing? Explain its importance for computational algorithms. **[05]**

b) Explain Monte Carlo method for Statistical Analysis. **[05]**

OR

Q.6 a) Explain the role of Battery management system for computational analysis. **[05]**

b) Explain the role of condition monitoring for computational analysis. **[05]**

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