Hall Ticket No | 2 | 3 | 9 | 5 | 1 | A | 0 | 5 | 5 | F | Course Code: ACSD05

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

B.Tech II SEMESTER CIE - II EXAMINATIONS JULY - 2024

Regulation: BT23

ESSENTIALS FOR PROBLEM SOLVING

(CSE | CSE (AI & ML) | CSE (DS) | CSE (CS) | CSIT | IT | ECE | EEE)

Time: 2 Hours **Max Marks: 20**

Answer any FOUR questions

All parts of the question must be answered in one place only

---

1. (a) Outline the role of a union-find structure in Kruskal's algorithm. Write Python implementation of the union - find data structure. [BL: Apply| CO: 4|Marks: 2]

   (b) Find a minimum spanning tree for the graph shown in Figure 1 using i) Kruskal's algorithm and ii) Prim's Algorithm. [BL: Apply| CO: 4|Marks: 3]

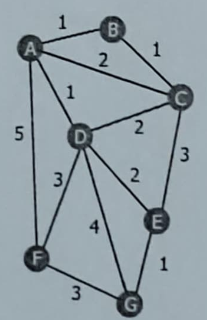

Figure 1

2. (a) Find the root of the equation $4e^{-x}\sin x - 1 = 0$ by regular-falsi method given that the root lies between 0 and 0.5. [BL: Apply| CO: 5|Marks: 2]

   (b) Using Newton–Raphson method, derive a formula for finding the kth root of a positive number N and hence compute the value of $(25)^{1/4}$. Use the Newton–Raphson method to obtain a root, correct to three decimal places, of each of the following equations:

   i) $e^x = 4x$

   ii) $x^3 – 5x + 3 = 0$

   iii) $xe^x = cosx$ [BL: Apply| CO: 5|Marks: 3]

3. (a) Using Ramanujan's method, find a real root of the equation $1 - x + \frac{x^2}{(2!)^2} - \frac{x^3}{(3!)^2} + \frac{x^4}{(4!)^2} = 0$ [BL: Apply| CO: 5|Marks: 2]

   (b) Find the real root, which lies between 2 and 3, of the equation $x log_{10} x – 1.2 = 0$ using the methods of bisection and false–position to a tolerance of 0.5% [BL: Apply| CO: 5|Marks: 3]

4. (a) Use the trapezoidal rule to evaluate the double integral $\int_{-2}^{2}\int_{0}^{4} (x^2 - xy + y^2)dx\, dy$ [BL: Apply| CO: 6|Marks: 2]

(b) Given $\frac{dy}{dx} = 1 + xy$, y(0)=1 Obtain the Taylor series for y(x) and compute y(0.1), correct to four decimal places. [BL: Apply| CO: 6|Marks: 3]

5. (a) Use Runge-Kutta fourth order formula for solving an initial value problem. Find y(0.1), y(0.2) and y(0.3) given that $y' = 1 + \frac{2xy}{1+x^2}$, y(0)=1 [BL: Apply| CO: 6|Marks: 2]

(b) Using the Euler and fourth order Runge-Kutta methods, find the values of y for x = 0.2, 0.4, 0.6, 0.8 and 1.0 for $\frac{dy}{dx} = y(1+x^2)$, y(0)=1 Compare the computed values with the exact values.

[BL: Apply| CO: 6|Marks: 3]

– ○○◯○○ –