BACHELOR OF ENGINEERING (ELECTRICAL ENGINEERING) FIFITH YEAR SECOND SEMESTER SUPPLEMENTARY EXAM - 2024

SUBJECT: ADVANCED COMPUTING TECHNIQUES

Time: Three Hours

Full Marks 100
(50 Marks for each part)

Use a separate Answer-Script for each part

Question No.	Part I	Marks

Answer any three questions

1. (a) What do you understand by "Finite Difference Method (FDM)"? Discuss (i) Forward (ii) Backward and (iii) Central Difference Scheme with respect to FDM. 10

(b) Solve to find the voltages at node 1 and node 2 as shown in Fig. 1 using FDM. Give explanations of the equations used. 6

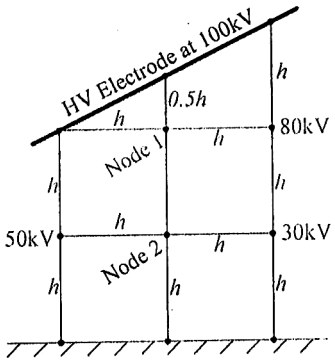

Fig. 1.

2. (a) Discuss how approximate solutions can be obtained from Finite Element Method (FEM). Explain in brief with the help of a simple geometrical pattern. 10

(b) A triangular lamina has the following coordinates and node voltages as shown in Fig. 2. Find the potential inside the element at (5, 5) by applying FEM. 6

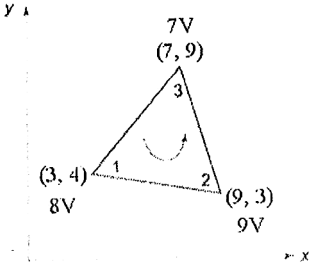

Fig. 2.

3. What do you understand by Artificial Neural Network (ANN)? Give a brief idea about how a solution closer to a given target value can be obtained by ANN by back propagation. 16

4. (a) Distinguish between Crisp (Boolean) Logic and Fuzzy Logic. Explain (i) Crisp Set, (ii) Fuzzy Set and (iii) Membership Function with respect to Fuzzy Logic. 10

(b) Give the scheme of implementing a Fuzzy Logic Controller in a system of your choice. Define the input and output parameters along with their dependencies. 6

5. (a) Discuss how the potential of a point of a two dimensional system can be evaluated with the help of potentials of the another four points with unequal distance. 6

(b) A differential equation is given by $\frac{d^2y}{dx^2} - y = 0$, with the constraints $y(0) = 1$ and $y'(0) = 0$. Use forward difference scheme of FDM and solve the equation. Comment on the percentage error versus the chosen step size. 10

Ref No:

Ex/EE/5/T/523A/2024(S)

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No. of Questions		PART-II Answer any Three (Two marks reserved for well-organized answers)	Marks
1)		Use the Simplex method to solve the following linear programming problem. Does it have an infinite number of solutions? If yes, find the complete solution using the weighted average of the solutions. $\text{Minimize } f = -40x_1 - 100x_2$ $\text{subject to: } 10x_1 + 5x_2 \le 2500$ $4x_1 + 10x_2 \le 2000$ $2x_1 + 3x_2 \le 900$ $x_1 \ge 0,\ x_2 \ge 0$	(16)
2)	(a)	Find the maximum value of $f(x,y) = 4x^2 + 10y^2$ subject to $x^2 + y^2 \le 4$. Use the method of Lagrangian Multipliers.	(8)
	(b)	Explain how the K-T conditions of a maximization function with given constraints are found concerning Lagrange Multipliers.	(8)
3)	a)	Discuss the Newton's method of solving the non-linear optimization problems.	(8)
	b)	Minimize $f(x_1,x_2) = x_1 - x_2 + 2x_1^2 + 2x_1x_2 + x_2^2$ starting from the point $x_1 = (0,0)$ using Cauchy's Steepest Descent method.	(8)
4)		Perform Two iterations of the non-linear simplex algorithm to Minimize $f(x_1,x_2) = (x_1^2 + x_2 - 11)^2 + (x_1 + x_2^2 - 7)^2$ The initial simplex is formed by the points $X_1 = (0, 0)$, $X_2 = (2, 0)$ and $X_3 = (1, 1)$ and the parameters of the algorithm are, $\alpha = 1$, $\beta = 0.5$ and $\gamma = 1.5$, where the notation have their usual meanings. Permissible error for convergence, $\varepsilon = 10\text{-}3$. Use the SIMPLEX Direct Search method of solving an Non Linear Programming problem.	(16)

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(**50** marks for this part)

5)	a)	Briefly Discuss Simulated Annealing.	(8)
	b)	Discuss the Marquardt's method for solving the non-linear optimization problems.	(8)