Roll No.												

PRESIDENCY UNIVERSITY

BENGALURU

Mid - Term Examinations – October 2025

Date: 09-10-2025 **Time:** 02.00pm to 03.30pm

School: SOCSE	**Program:** CSE, CBC, CCS, CIT, CBD, CDV, CSN, CSI	
Course Code: CSE2264	**Course Name:** Essentials of AI	
Semester: V	**Max Marks**: 50	**Weightage**: 25%

CO - Levels	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Marks	**20**	**30**	**-**	**-**	**-**

Instructions:

(i) Read all questions carefully and answer accordingly.

(ii) Do not write anything on the question paper other than roll number.

Part A

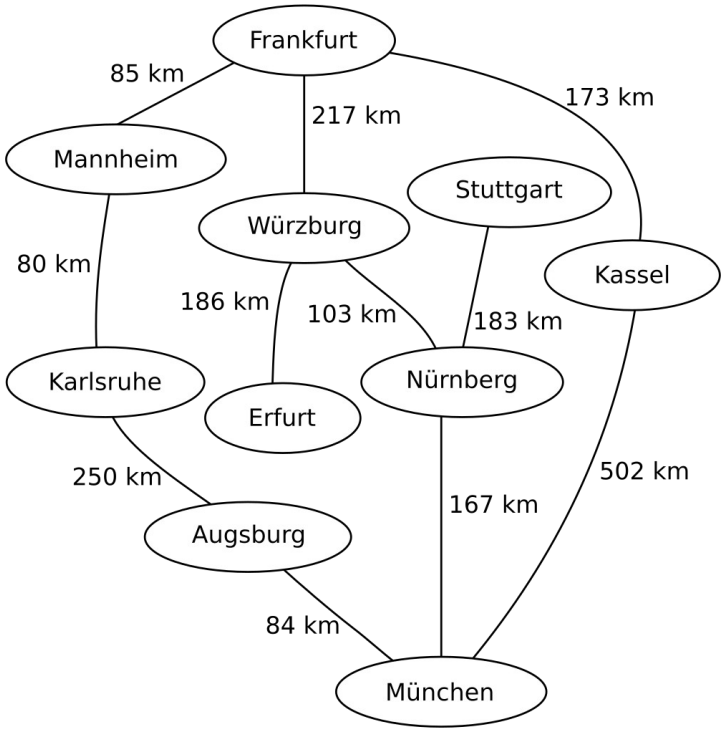
Answer ALL the Questions. Each question carries 2marks. **5Q x 2M=10M**

1	State true or false. For a given branching factor b, and a solution at a depth d, the number of operations for Iterative Deepening DFS is $\sum_{i=0}^{d} (d-i)*b^i$	**2 Marks**	**L1**	**CO1**
2	A generalized cost function for heuristic searches is given by f(n) = a*g(n) + b*h(n). State the values of a and b for weighted A* search, where w = 2.	**2 Marks**	**L1**	**CO1**
3	State the minimum number of variables in the N Queen's Problem.	**2 Marks**	**L1**	**CO1**
4	State the recurrence T(m) for alpha-beta pruning if there is maximum pruning.	**2 Marks**	**L1**	**CO1**
5	State Yes or No. In the water jug problem, with 2 jugs of 3 litres and 5 litres, we can measure out 4 litres of water, such that we will be having 2 litres in each of the 2 jugs.	**2 Marks**	**L1**	**CO1**

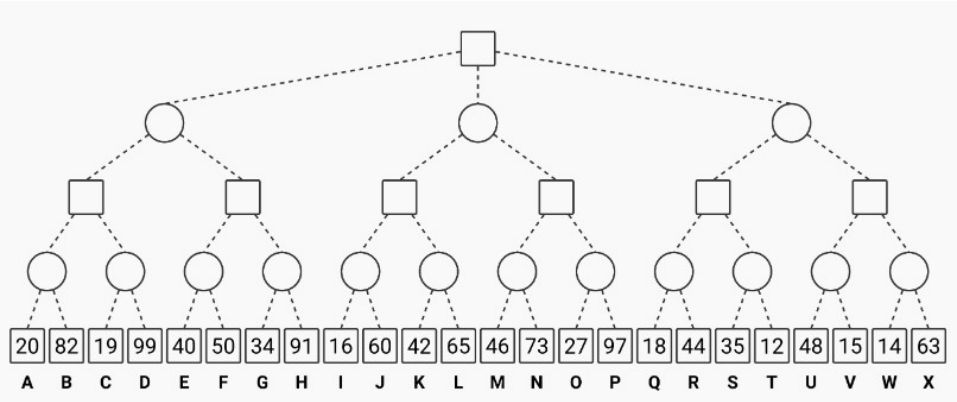
Part B

Answer the Questions. **Total Marks 40M**

6.	Consider a graph which has a depth d = 5, and a branching factor b = 10. Compute the number of nodes visited using Breadth First Search and Iterative Deepening Depth First Search starting from the root node. Assume that the root node is at a depth of 0.	**10 Marks**	**L2**	**CO1**
	Or			
7.	Consider the following graph, where we have 7 nodes (A, B, C, D, E, F, and G), with bidirectional edges (i.e. AB is same as BA) – AB (2), AC (1), BD (2), CD (1), DE (2), DF (1), EG (2), and FG (1). The heuristic values of the nodes are: h(A) = 9, h(B) = 4, h(C) = 8, h(D) = 4, h(E) = 1, h(F) = 1, and h(G) = 0. Compute the path predicted by the A* search and its length	**10 Marks**	**L2**	**CO1**

8.	This is an abstraction showing cities in southern Germany and the distances between them.  Demonstrate **Dijkstra's SSSP** starting from **<u>Erfurt</u>** to visit every other city.	**15 Marks**	**L3**	**CO2**
	Or			
9.	Given a 6 litre jug and a 9 litre jug, solve the water jug problem to fill out all integral volumes of water from 1 litre to 15 litres. State which	**15 Marks**	**L3**	**CO2**

	volumes of water cannot be filled as well.			

10.	Consider a ***10 Queen's Problem*** where we have to arrange 10 queens on a 10x10 chessboard. We plan to solve this using local search by having a fitness function F(c), where c is the configuration of the chessboard, represented as a 10-dimension vector where each number is the row-number of the queen on the chessboard.  For example, in the above figure the configuration, C = [1,8,2,9,6,3,10,4,7,5]. Our fitness function F(C) = 45 – P, where P is the number of ***distinct attacking pairs of queens*** (NOTE: Queen 1 attacking Queen 2 is considered the same as Queen 2 attacking Queen 1). The given figure shows P = 0 (since no queen is attacking another), so the fitness function F([1,8,2,9,6,3,10,4,7,5]) = 45-0 = 45. **Calculate** the fitness function of **[1,3,5,7,9,4,2,6,8,10]**.	**15 Marks**	**L3**	**CO2**
	Or			
11.	For the game tree given below (circles are min nodes and squares are max nodes):  a) Calculate the expected utility at the root. b) Perform alpha-beta pruning c) Perform ideal ordering	**15 Marks**	**L3**	**CO2**

	d) Perform alpha-beta pruning of the ideal ordered tree.			