No. of Printed Pages : **2**

Sl. No.

B1.2-R5 : DISCRETE STRUCTURE

NOTE :

1. **Answer question 1 and any FOUR from questions 2 to 7.**
2. **Parts of the same question should be answered together and in the same sequence.**

Total Time : 3 Hours **Total Marks : 100**

1. (a) List the different types of graphs with example.

(b) Explain the various Connectives in Propositional Logic with tables.

(c) Explain the ways a set can be represented.

(d) Explain the principle of inclusion and exclusion for set $= \{A_1, A_2, A_3\}$.

(e) Describe cardinality and different types of sets.

(f) What is the difference between Universal ($\forall$) and Existential ($\exists$) quantifiers ?

(g) Write a short note on various asymptotic Notations used for algorithms. **(7x4)**

2. (a) Describe partially ordered set and Hasse diagram with example.

(b) Discuss the Insertion Sort algorithm. Write the steps of Insertion Sort algorithm in pseudocode notation and analyze the algorithm. Give an example to show its working. **(8+10)**

3. (a) What is the pigeonhole principle ? Show that any subset of size 5 from the set $S = \{2, 3, 4, 5, 6, 7, 8, 9\}$ must contain 2 elements whose sum is 11.

(b) What are generating functions ? Why are they useful ? Solve the following recurrence relation using generating functions method :

$a_{r+2} - 3a_{r+1} + 2a_r = 0$ such that $a_0 = 2$ and $a_1 = 3$ **(10+8)**

4. (a) Differentiate between a spanning tree and a minimum spanning tree for a graph. What is the Prim's algorithm for finding the minimum spanning tree for a graph ? Write the algorithm using pseudocode. Analyze the complexity of the above algorithm.

(b) Among 50 patients admitted to a hospital, 25 are diagnosed with pneumonia, 30 with bronchitis, and 10 with both pneumonia and bronchitis. Determine :

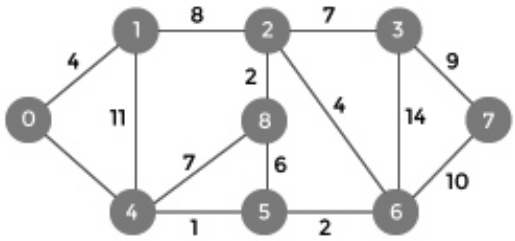
(i) The number of patients diagnosed with pneumonia or bronchitis (or both).

(ii) The number of patients not diagnosed with pneumonia or bronchitis. **(10+8)**

5. (a) Differentiate between the depth first search and breadth first search algorithm.

(b) Explain the divide and conquer algorithm design technique. Write the pseudocode for the general algorithm using divide and conquer. List the advantages and disadvantages of this algorithm design technique. **(10+8)**

6. (a) What is the use of Dijkstra's algorithm in graphs ? Explain the working of Dijkstra's algorithm on the following graph.



(b) How can you implement the bubble sorting algorithm using the python programming language ? **(12+6)**

7. (a) What are the differences between greedy method and dynamic programming method for algorithm design ? Discuss and write the pseudocode for finding the longest common subsequence using dynamic programming technique. What is the time complexity of this algorithm ?

(b) Differentiate between the adjacency matrix and adjacency list methods for storage and representation of graphs. **(10+8)**

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