

No. of Printed Pages : 4

Sl. No.

B1.2-R5 : DISCRETE STRUCTURES

DURATION : 03 Hours

MAXIMUM MARKS : 100

Roll No. :

--	--	--	--	--	--

Answer Sheet No. :

--	--	--	--	--	--

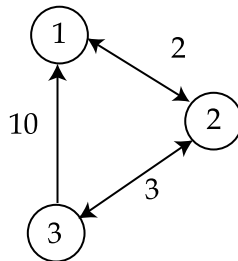
Name of Candidate : _____ ; **Signature of Candidate :** _____

INSTRUCTIONS FOR CANDIDATES :

- Carefully read the instructions given on Question Paper, Answer Sheet.
- Question Paper is in English language. Candidate has to answer in English Language only.
- Question paper contains Seven questions. The Question No. 1 is compulsory. Attempt any FOUR Questions from Question No. 2 to 7.
- Parts of the same question should be answered together and in the same sequence.
- Questions are to be answered in the ANSWER SHEET only, supplied with the Question Paper.
- Candidate cannot leave the examination hall/ room without signing on the attendance sheet and handing over his/her Answer Sheet to the Invigilator. Failing in doing so, will amount to disqualification of Candidate in this Module/Paper.
- After receiving the instruction to open the booklet and before answering the questions, the candidate should ensure that the Question Booklet is complete in all respects.

DO NOT OPEN THE QUESTION BOOKLET UNTIL YOU ARE TOLD TO DO SO.

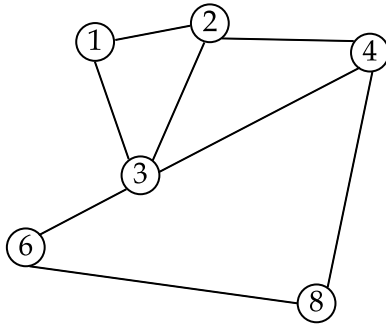
1. (a) Given the sets A and B such that $A = \{2, 3, 4, 5\}$ and $B = \{4, 16, 23\}$, where $a \in A, b \in B$. Find the set of ordered pairs such that $a^2 < b$.
- (b) Consider proposition P : "The cake is chocolate" and Q : "The cake is delicious". Express the statement, "The cake is not chocolate but still delicious", using propositional variables and logical connectives.
- (c) Give the simplified big-O notation for the function $f(n)$, where, $f(n) = 3n^3 + 2n^2 + 4n + 1$.
- (d) For a given graph G, construct the Minimum Spanning Tree.



- (e) In a group of friends, each person is asked to choose a day of the week (Monday, Tuesday, ..., Sunday). What is the minimum number of friends needed to guarantee that at least four friends have chosen the same day of the week ?
 - (f) Explain the key differences between Recursion and Dynamic Programming.
 - (g) What do you mean by Backtracking ? Differentiate between Decision and Optimization problems in backtracking. (7x4)
2. (a) There are 140 dolls in a room, labeled from the number 1 to 140. The dolls who are labeled with even number have their one eye torn off. While the dolls labeled with number that are divisible of 3 have one hand torn off. Also, the dolls labeled with number that are divisible of 5 have one ear torn off. Determine how many dolls do not have any torn off.
 - (b) Suppose that R is the relation on the set of strings that consist of English letters such that aRb if and only if $l(a) = l(b)$, where $l(x)$ is the length of the string x. Is R an equivalence relation ?
 - (c) Suppose the function $f()$ is defined by :
 $f(0) = 3,$
 $f(n + 1) = 2f(n) + 3$ (6+6+6)
 Find $f(1), f(2), f(3), f(4)$.
3. (a) Given the premises :
 P
 $P \rightarrow Q$
 $S \vee R$
 $R \rightarrow \neg Q$
 Derive the conclusion $S \vee U$
 - (b) (i) There is exactly one prime number.
 (ii) There are two students who have taken all the same courses. (10+8)

4. (a) Write the linear search algorithm to search an element in the unordered data. Also discuss its time complexity.
 (b) Sort the following data using Insertion Sort : 4, 1, 3, 2, 5.
 (c) Discuss different asymptotic notations in complexity analysis. (6+6+6)

5. (a) Explain, circuits in a graph. Also, identify a circuit in the following graph.



- (b) What do you mean by Breadth First Search strategy ? How does it differ from the Depth First Search strategy ? Explain in details. (10+8)
6. (a) How many different teams of three players can be formed from a group of eight players (Amy, Baine, Carol, David, Emma, Frank, Grace and Henry) if Emma and Frank refuse to be in the same team ?
 (b) Suppose there are 8 books on fairy tales, 6 novels and 10 plays. In how many ways can you arrange these, so that books on fairy tales are together, novels are together and plays are together ? (10+8)
7. (a) Explain Prim's algorithm to find minimum spanning tree with suitable example.
 (b) Write down the algorithm for Longest Common Subsequence using Recursion. (10+8)

- o O o -

SPACE FOR ROUGH WORK