

END TERM EXAMINATION

IT 205

Discrete Structure

Nov/Dec-2022

Time: 03:00 Hours

Max. Marks: 50

Note : All questions carry equal marks.
Assume suitable missing data, if any.

Q.1 (a) (i) How many symmetric and reflexive relations are possible from a set A containing 'n' elements? [3] [CO1]

(ii) Show that the propositions $p \rightarrow q$ and $\neg p \vee q$ are logically equivalent. [2] [CO1]

(b) Explain Boolean Function? What is the simplified sum of product form for the Boolean expression:

$$(A + B' + C')(A + B' + C)(A + B + C')$$

[5] [CO2]

Q.2 (a) Calculate the Time complexity of Quick sort algorithm in term of recurrence relation. Sort the list $X = \{42, 28, 90, 2, 56, 39, 12, 87\}$ using quick sort. [5] [CO4]

(b) Using principal of mathematical induction prove that $\sqrt{n} < \frac{1}{\sqrt{n}} + \frac{1}{\sqrt{2}} + \frac{1}{\sqrt{3}} + \dots + \frac{1}{\sqrt{n}}$ for all natural numbers $n \geq 2$. [5] [CO3]

Q.3 (a) (i) A teacher gives a multiple-choice quiz that has 5 questions, each with 4 possible answers: a, b, c, d. What is the minimum number of students that must be in the class in order to guarantee that at least 4 answer sheets will be identical? (Use Pigeon hole principle).

[3] [CO4]

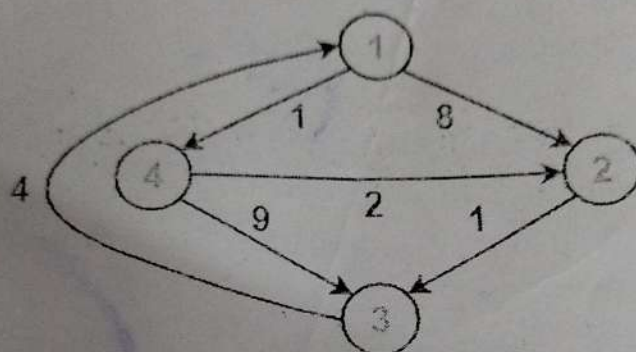
(ii) Let R be a relation on the set $A = \{1, 2, 3, 4\}$ such that aRb if and only if $a + b > 5$. Check if R is reflexive, transitive. [2] [CO3]

(b) Define Equivalence Relation. If R and S be two equivalence relation in a set A, then prove that $R \cup S$ is also an equivalence relation in A. Also give suitable example. [5] [CO3]

Q.4 (a) Let $x = \{1, 3, 5, 7, 15, 21, 35, 105\}$ and R be the relation ' $/$ ' (divides) on the set x then x is the Poset. Draw the Hasse diagram of the given Poset. Determine the following:

- LUB of 3 and 7
 - GLB of 15 and 35.
 - Greatest and Least element of x .
- (b) Consider the following directed weighted graph-

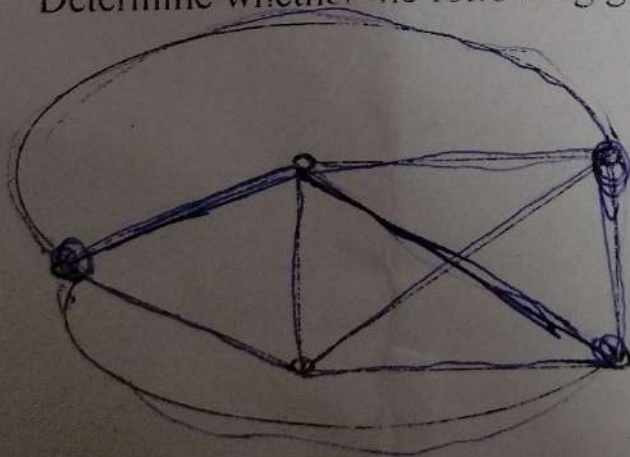
[5][CO5]



Using Floyd Warshall Algorithm, find the shortest path distance between every pair of vertices.

[5][CO5]

Q.5 (a) Determine whether the following graph is:



- Hamiltonian, if yes, find the Hamiltonian cycle.
- Eulerian, if yes, find the Euler cycle.

[5][CO5]

(b) Explain the following with suitable example:

- Connected Graph
- Planar Graph
- Vertex colouring of graph
- Rooted Tree
- Bipartite Graph

[5][CO6]