i) $a + b = b$ ii) $a * b = a$

iii) $a + b = 1$ iv) $a * b = 0$

6. a) Define sum of products form, complete sum of products form and prime implicants in Boolean algebra. 6

b) Express the following Boolean expression as a sum of products and then in its complete sum of products form:

$E(x, y, z) = x(xy' + x'y + y'z)$ 4

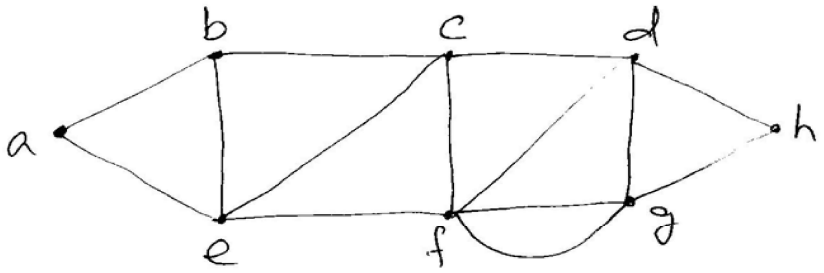
c) Find all the prime implicants of the following Boolean expression: 4

$E(x, y, z) = xy + y't + x'yz' + xy'zt'$

UNIT - IV

7. a) Define complete graph, regular graph and Bipartite graph with examples. 6

b) Define incidence matrix and adjacency matrix for a simple undirected graph. Find the incidence matrix and adjacency matrix for the following graph. 8



UG EVEN SEMESTER (CBCS) EXAMINATION, SEPTEMBER - 2021

COMPUTER SCIENCE

4th Semester

COURSE NO. MCSCC - 402(C)

(Discrete Mathematics)

Full Marks : 70
Pass Marks : 28

Time : 3 hours

The figures in the margin indicate full marks for the questions

(Answer any five questions, taking one from each unit)

UNIT - I

1. a) Define converse and contrapositive of a statement. Write the converse and contrapositive of the following statements:- 7

i) If she works, she will earn money,

ii) If it snows, then they do not drive the car.

b) Write the logical forms of the following statements and then write the negation of each statement: 7

i) "If the teacher is absent, then some students do not complete their homework."

ii) "Some of the students did not complete their homework or the teacher is absent."

iii) "All the students completed their homework and the teacher is present.

2. Check whether the following arguments are valid or not:

i) "If two sides of a triangle are equal, then the opposite angles are equal. Two sides of a triangle are not equal. So the opposite angles are not equal."

ii) If I study, then I will not fail in Mathematics. If I do not play cricket, then I will study. But I failed in Mathematics. Therefore I must have played cricket."

iii) "If a man is unemployed, he is unhappy. If a man is unhappy, he dies young. Therefore unemployed's die young." 5+5+4=14

UNIT - II

3. a) Let Q be the set of rational numbers and let * be the operation on Q, defined as $a*b = a+b - ab$. Show that Q - {1}, is a group w.r.t. $*$ 5

b) Define semigroup. Let S = NxN and * be the operation on S defined by $(a, b) * (a', b') = (a+a', b+b')$

i) Show that $*$ is associative

ii) Define $f : (s, *) \rightarrow (z, +)$, by $f(a, b) = a-b$. Show that 'f' is a homomorphism.
(where 'Z' is the set of integer) 1+1+2=4

c) If G is a group, then prove the following:

i) The identity element of G is unique.

ii) Every $a \in G$ has a unique inverse in G

iii) For every $a \in G$, $(a^{-1}) = a$

iv) For all $a, b \in G$, $(a. b)^{-1} = b^{-1}. a^{-1}$

4. a) Define Hasse diagram. Draw the Hasse diagram of the following partial ordered sets:

i) A = { 1, 2, 3, 4, 5, 6, 8, 9, 12, 18, 24}, and the partial relation is x divides y.

ii) D_{36} = { 1, 2, 3, 4, 6, 9, 12, 18, 36 } and the partial relation is divides y. 1+2+2=5

b) Define distributive lattice. Let L be a bounded distributive lattice. Then show that complements are unique if they exist. 5

c) Define minimal and maximal elements of a partially ordered set with example. 4

UNIT - III

5. a) In a Boolean algebra B, show that - 7

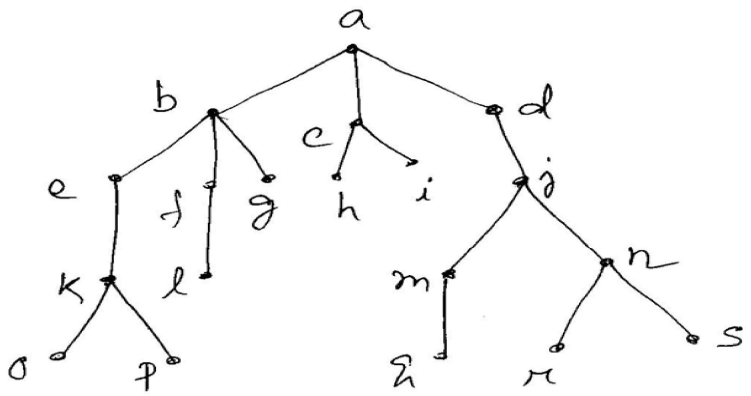
i) $(a + b)' = a' * b'$

ii) $(a * b)' = a' + b'$

where symbols have their usual meanings.

b) Define Boolean algebra. Show that the following are equivalent in a Boolean algebra: 7

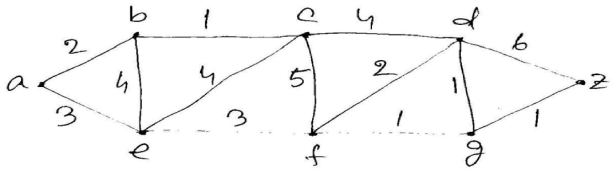
8. Write the preorder and inorder algorithms for traversing vertices of a ordered rooted tree. In which order the vertices of the following tree will be visited by using preorder and inorder traversal? 14



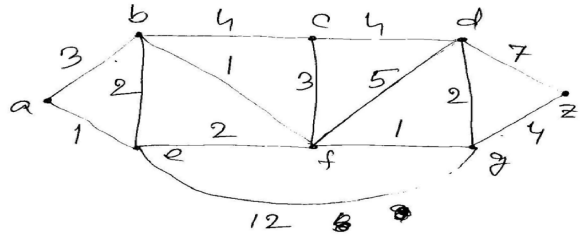
UNIT - V

9. Write Dijkstra's algorithm for finding the shortest path of a weighted graph. Using Dijkstra's algorithm, find the shortest path between the vertices 'a' and 'z' for the following graphs: 14

i)



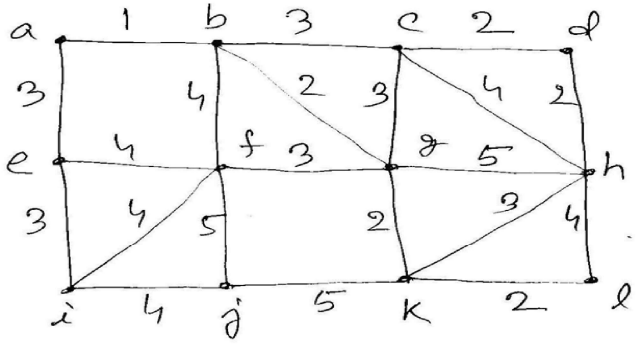
ii)



10. a) Define spanning tree and minimum spanning tree. Write the Kruskal algorithm, for finding minimum spanning tree of a wrighted graph. 6

b) By using Kruskal algorithm, find a minimum spanning tree for the following graphs: 4+4=8

i)



ii)