Paper - 1.2 ① ~~MFCS~~ MCA 1st Semester 2019, MFCS,

Q1

(a) Express the following statements using quantifiers
(i) All dogs ~~are~~ have fleas. (ii) There is a ~~horn~~ horse that can add. (iii) Every Koala can climb.
(iv) No monkey can speak French (v) There exists a pig that can swim and catch fish [7

(b) Using ~~Structural induction show that~~

(b) Give recursive definition of a set S that contains all positive integers that are multiple of 3. Then using structural induction prove that the definition of S is correct [7

OR

(C) Using rules of inference, ~~show that~~ verify the following. [7
Show that the Premises "A student in this class has not read the book" and "Everyone in this class passed the first exam" imply the conclusion "Someone who passed the first exam has not read the book". [7

(d) Using induction Prove that
$$1^2 + 3^2 + 5^2 + \cdots + (2n+1)^2 = (n+1)(2n+1)(2n+3)/3$$

Q2

(a) Show that in any graph there are even number of vertices of odd degree [7

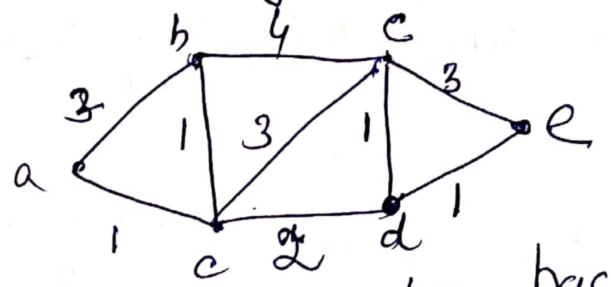
(b) Using Havel's-Hakim verify if the following degree sequence is a graphics. If so then draw the graph
degree Seq = (3, 3, 3, 3, 2)

OR

(c) Show that a tree with n-vertices has (n-1)-edges [7

(d) ~~Solve~~ Using Havels-Hakim verify if the degree sequence (3, 2, 2, 1, 0) is a graphice if so, then draw the graph [7

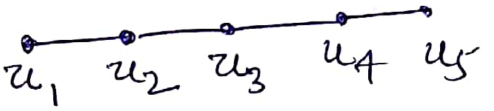
Q3 (a) Using Dijkstra's shortest path algorithm find the shortest path from source vertex 'a' to the remaining vertices of the following graph [7



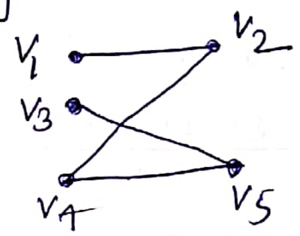
(b) Show that a tree has atleast two pendant vertices

OR

(c) Verify if the following two graphs are isomorphic. ~~using~~ [7



graph: G_1



graph: G_2

(d) Show that if ~~two~~ graphs G is isomorphic to H, then $\bar{G}$ is also isomorphic to $\bar{H}$. Where ~~G and~~ $\bar{G}$, $\bar{H}$ are complement of G and H respectively [7

Q4 (a) Show the a relation R on a set 'A' is transitive if and only if $R^n \subseteq R$ for $n = 1, 2, 3 - -$

(b) For the poset $(\{1, 2, 4, 8, 16, 32, 64\}, '|')$ find maximal, minimal, greatest, least elements and obtain their topological sort [7

OR

(c) Let $R = \{(1,2), (1,3), (2,3), (2,4), (3,1)\}$ be a relation on set $A = \{1, 2, 3, 4\}$. Find reflexive, symmetric and transitive closures of R [7]

(d) Solve Q 4(a).

Q5 Solve the following recurrence relations

(a) $a_n = 4a_{n-1} - 4a_{n-2} + (n+1)2^n$ [7]

(b) $a_n = 7a_{n-1} - 16a_{n-2} + 12a_{n-3} + n4^n$ [7]

OR

Solve the following recurrence relations

(c) $a_n = 8a_{n-2} - 16a_{n-4} + n2^n$ [7]

(d) $a_n = 6a_{n-1} - 12a_{n-2} + 8a_{n-3} + 2^n$ [7]