322452(14)

B. E. (Fourth Semester) Examination, ~~2020~~
APR-MAY 2022
(New Scheme)

(CSE Engg. Branch)

DISCRETE STRUCTURES

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : All questions are compulsory. Part (a) from each question is compulsory. Attempt any two parts from (b), (c) and (d) each question.

Unit-I

1. (a) Define Quantifiers.   2

   (b) Define logical equivalence statement. Prove that

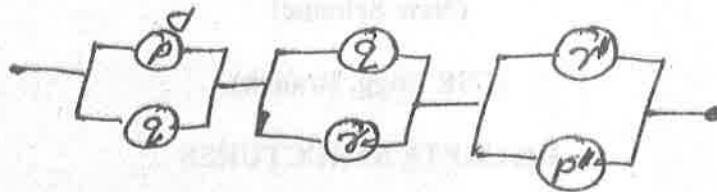 $$p \Rightarrow (q \Rightarrow r) \equiv (p \wedge q) \Rightarrow r .$$ 7

(c) Define conjunctive normal form. Write the following into conjunctive normal form in which maximum number of variable are used $(x+y+z)(xy+x'z)'$. 7

(d) For the following mixed switching circuit, find the simplified circuit after simplifying the switching function. 7

Unit-II

2. (a) Define Partial Order Relation. 2

(b) Define Equivalence Relation. Show that the relation "$xRy(=)x-y$ is divisible by 5" where $x, y \in I$ defined in the set of integers I is an equivalence relation. 7

(c) Let L be the set of all factors of 12 and Let '/' be the divisibility relation on L. Show that $(L, /)$ is a Lattice. 7

(d) If $f:X \to Y$ and $g:Y \to Z$ be one-one onto mapping, then prove that the mapping $g \circ f : X \to Z$ is also one-one onto and $(g \circ f)^{-1} = f^{-1} \circ g^{-1}$. 7

Unit-III

3. (a) How many generators are there of the cyclic group G of order 10? 2

(b) Prove that fourth roots of unity forms and abelian group with respect to multiplication. 7

(c) State and prove Lagrange's theorem. 7

(d) Define Field and prove that every field is an integral domain. 7

Unit-IV

4. (a) Define Hamiltonian Graph with example. 2

(b) Use Dijkstra algorithms to find the shortest path between a to f in given weight graph. 7
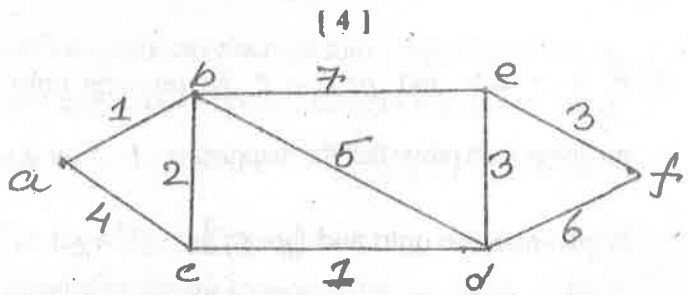
(c) Show how Kruskal's algorithm finds a minimal spanning tree of the graph of   7
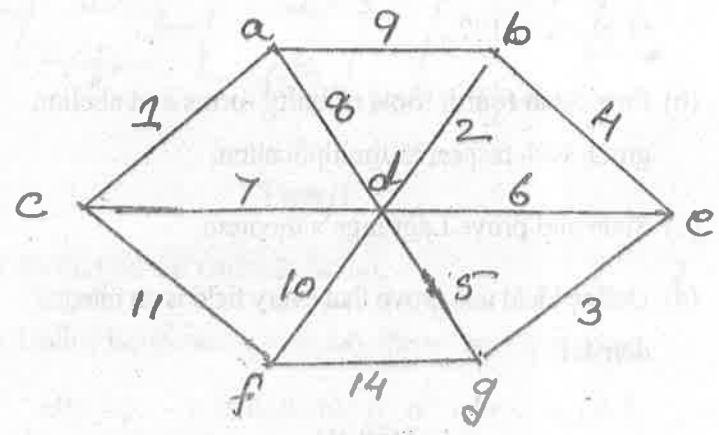
(d) Show that the minimum height of a binary tree on n vertices is $\log_2(n+1) - 1$ and maximum possible height is $\dfrac{n-1}{2}$.   7

Unit-V

5. (a) Write Generalized Pigeonhole Principle.   2

(b) Find the number of integers between 1 and 250 that are divisible by any of the integers 2, 3, 5 and 7.   7

(c) Solve the difference equation

$$a_r - 4a_{r-1} + 4a_{r-2} = 2, \ (r+1)2^r$$ 7

(d) Solve by the method of generating functions the recurrence relation

$$a_r - 5a_{r-1} + 6a_{r-2} = 2, \ r \geq 2$$

with the boundary condition $a_0 = 1$ and $a_1 = 2$.   7