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322412(14)

B. E. (Fourth Semester) Examination, April-May 2021

(Old Scheme)

(CSE, IT Engg. Branch)

DISCRETE STRUCTURE

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : *Attempt all questions. Part (a) is compulsory. Solve any two parts from (b), (c) and (d). Each carry 7 marks.*

Unit-I

1. (a) Is the statement $(\sim p) \vee q$ is a tautology? 2

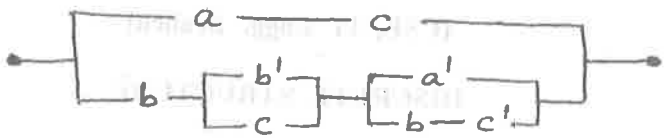
(b) State and prove Idempotent law. 7

(c) Convert the Boolean function 7

$$f(x,y,z)=(x'+y+z').(x'+y+z)(x+y'+z)$$

in disjunctive normal form.

(d) Replace the following switching circuit by a simpler one: 7



Unit-II

2. (a) Write the set $A=\{x : x^2-3x+2=0\}$ in tabular form. 2

(b) If A, B, C are any three non - empty sets, then prove that $(A-B)\times C=(A\times C)-(B\times C)$ 7

(c) Answer these questions for the poset 7

$(\{\{1\},\{2\},\{4\}\{1,2\},\{1,4\},\{2,4\},\{3,4\},\{1,3,4\},$

$\{2,3,4\}\}\subseteq)$

(i) Find the maximal elements.

(ii) Find the minimal elements.

(iii) Is there a greatest element?

(iv) is there a least element?

(v) Find all upper bounds of $\{\{2\},\{4\}\}$

(vi) Find the least upper bound of $\{\{2\},\{4\}\}$, if it exists.

(vii) Find all lower bounds of $\{\{1,3,4\},\{2,3,4\}\}$

(viii) Find the greatest lower bound of $\{\{1,3,4\},$ $\{2,3,4\}\}$, if they exists.

(d) Show that the mapping $f : R \to R$ be defined by $f(x)=ax+b$, where $a, b, x \in R$, $a \neq 0$ is invertible. Define its inverse. 7

Unit-III

3. (a) Define order of an element. 2

(b) Show that the set $\{1,2,3,4,5\}$ is not a group under addition and multiplication module 6. 7

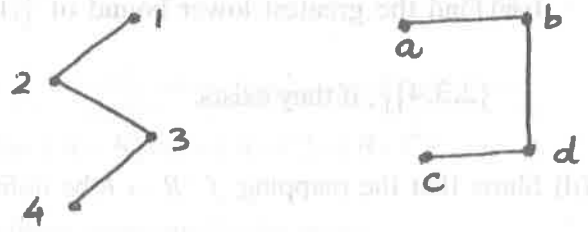
(c) State and prove Lagrange's theorem. 7

(d) Prove that, every field is an integral domain. 7

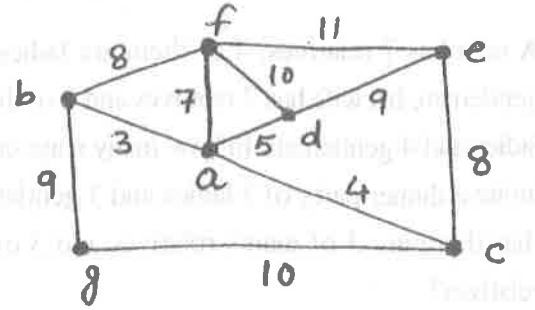
Unit-IV

4. (a) Does there exists a 4 - regular graph on 6 vertices if so construct a graph. 2

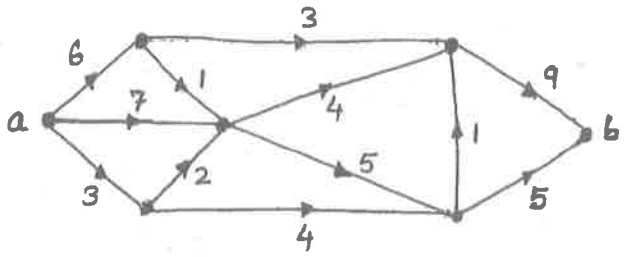
(b) Define isomorphic graph. Show that the two graphs shown in figure are isomorphic. 7



(c) Find the minimum spanning tree for the graph in figure by Kruskal's algorithm : 7



(d) Find the maximum flows between a and b in the diagram below where arrow represents direction of flow : 7



Unit-V

5. (a) Write principle of mathematical induction. 2

(b) Write generalized Pigeonhole principle. Find the minimum number of students in a class to be sure

that four out of them are born in the same month. 7

(c) A man has 7 relatives, 4 of them are ladies and 3 gentleman, his wife has 7 relatives and 3 of them are ladies and 4 gentleman. In how many ways can they invite a dinner party of 3 ladies and 3 gentleman so that there are 3 of man's relatives and 3 of wifes relatives? 7

(d) Solve $a_n = a_{n-1} + 2a_{n-2}, n \geq 2$ with the initial conditions $a_0 = 0, a_1 = 1$ 7