Total No of Questions: [8] ***SEAT NO. :***

[Total No. of Pages : 3]

S.E. (Computer Engineering)
Discrete Structure (2012 Course)
(Semester - I)

Time: 2 Hours ***Max. Marks : 50***

Instructions to the candidates:

1) ***Attempt Q1 or Q2 , Q3 or Q4, Q5 or Q6 , Q7 or Q8***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Use of Calculator is allowed.***
5) ***Assume Suitable data if necessary***

Q1) a) With the help of mathematical induction prove that, [4]

$$1^2 + 3^2 + 5^2 + (2n-1)^2 = \frac{n(2n-1)(2n+1)}{3}$$

b) Over the universe of book defined propositions [2]

B(x): x has blue cover

M(x): x is maths book

I(x): x published in India

Translate the following

i) $\forall x(M(x) \wedge I(x) \rightarrow B(x))$

ii) There are maths books published outside India.

c) Let x={1,2,……..,7} and R={(x,y)|x-y is divisible by 3}. Show that R is equivalence relation. Draw graph of R. [6]

Q2) a) Prove the following using venn diagram [2]

$$A \cap (B \oplus C) = (A \cap B) \oplus (A \cap C)$$

b) Among the integers 1 to 1000 [4]

i) How many of them are not divisible by 3 nor by 5 nor by 7.

ii) How many are not divisible by 5 or 7 but divisible by 3.

c) Let x = {2,3, 6, 12, 24, 36} x ≤ y if x divides y [6]

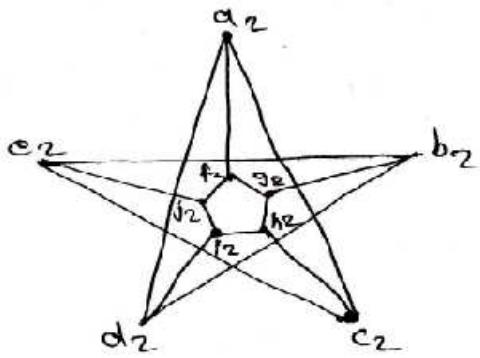
Find

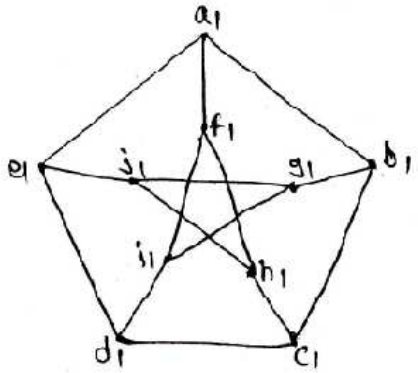
1. Maximal element
2. Minimal element
3. Chain
4. Antichain
5. Is poset lattice ?

Q3) a) Define the following [6]

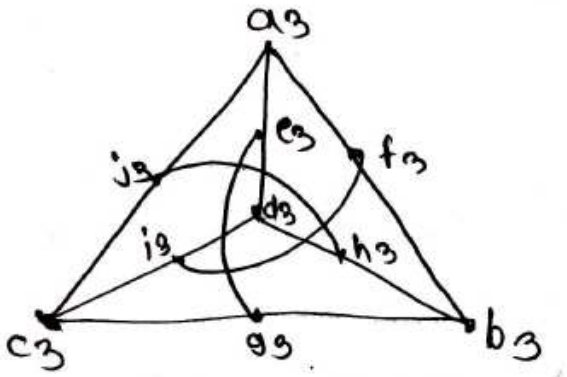
1. Group
2. Ring
3. Field

b) Show that the following graphs are isomorphic [6]



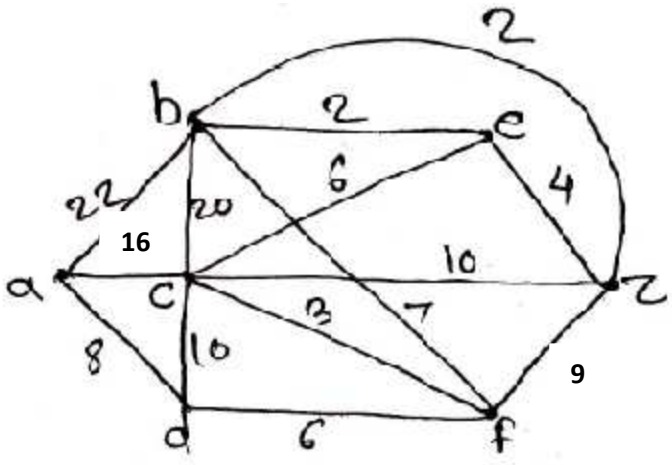


G1 G2



G3

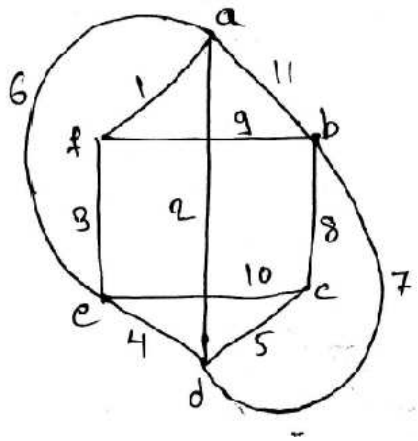
Q4) a) Find the shortest distance in the given figure from a to z by using Dijkstra shortest path algorithm [6]



b) Prove that the set Z of all integers with binary operation * defined by a * b = a + b + 1such that ∀a,b∈ Z is an abelian group [6]

Q5) a) For the following set of weights, construct optimal binary prefix code. For each weight in the set, give the corresponding code words. 10,30,05,15, 20,15, 05. [7]

b) Find the minimum spanning tree of the given figure using Kruskal's algorithm [6]



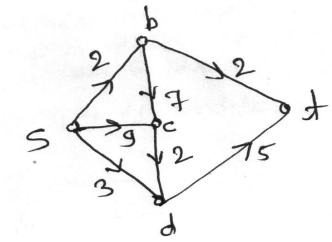
Q6) a) Define the following terms with reference to tree with example [6]

i. Level and height of a tree

ii M-ary tree

iii Eccentricity of a vertex

b) Find the maximum flow of the transport network given in the figure. [7]



Q7) a) A husband and wife appear in an interview for two vacancies in the same post. The probability of husband's selection is 1/7 and that of wife's selection is 1/5. what is the probability that [7]

1. both of them will be selected
2. only one of them will be selected
3. none of them will be selected

b) How many numbers of 7 digits can be formed with the digits 0,2,2,5,6,6,6 . How many of them are even ? [6]

Q8) a) A committee of 5 people is to be formed from a group of 4 men and 7 women. How many possible committees can be formed if at least 3 women are on the committee? [6]

b) A box contains 6 red, 4 white and 5 black balls. A person draws 4 balls from the box at random. Find the probability that among the balls drawn there is at least one ball of each color. [7]