[Total No. of Questions: 12] Total No. of Pages : 05

Seat No:

210241 - Discrete Structures

S. E. (Common for Computer Engg./Information Technology)

2008 Pattern (Semester-I)

Duration: - 3 Hours. **Max. Marks: - 100**

Instructions to the candidates

1. *Answer Question 1 or 2, 3 or 4, and 5 or 6 from section - I and Question 7 or 8, 9 or 10, and 11 or 12 from section – II.*
2. *Answers to the two sections should be written in separate answer books.*
3. *Neat diagrams must be drawn wherever necessary.*
4. *Figures to the right indicate full marks.*
5. *Assume suitable data if necessary.*

SECTION – I

Q1. A Use mathematical induction to show that: [6]
$1/1.2 + 1/2.3 + 1/3.4 + \ldots\ldots + 1/n(n+1) = n/(n+1) \; \forall \; n \geq 1$

B Over the universe of book defined propositions [4]

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 100 of the 120 engineering students in a college take part in at least one of the activity group discussion, debate and quiz. Also 65 participate in group discussion, 45 participate in debate, 42 participate in quiz, 20 participate in group discussion and debate, 25 participate in group discussion and quiz 15 participate in debate and quiz. [6]

Find the number of students who participate in:

i) All three activities
ii) Exactly one of the activity

OR

Q2. A With the help of mathematical induction prove that, [6]

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

B What is Multiset? With reference to multiset define the following with example [6]
i) Multiplicity
ii) Union
iii) Intersection
iii) Difference

C Explain the concept of countable finite and infinite set with example [4]

Q3. A let G={even, odd}and binary operation $\oplus$ be defined as [6]

$\oplus$	Even	Odd
even	even	Odd
odd	odd	even

Show that (G, $\oplus$) is a group.

B Define the following term with reference to Group theory with suitable example. [6]
i) Homomorphism
ii) Automorphism
iii) Isomorphism

C Let (A,*) be a group ,Show that (A,*) is an abelian group if and only if $a^2 * b^2=(a*b)^2$ [4]

OR

Q4. A Prove that the set Z of all integers with binary operation * defined by a*b =a+b+1 $\forall$ a, b $\in$ Z is an abelian group. [6]

B Define the following terms with reference to Group theory. [4]
i) Abelian group
ii) Cyclic group

C Consider the Group G= {1,2,3,4,5,6} under multiplication modulo 7 [6]
1. Find the multiplication table of G.
2. Find 2^{-1} , 3^{-1} , 6^{-1}
3. Is G Cyclic ?

Q5. A Let A,B,C are set of real numbers . f : A →>B; g : B→ C be defined by f(a) = a-1; g(b) = b^2 .Find [8]

1. (fog)(2)
2. (gof)(2)
3. (gof)(x)
4. (fog)(x)
5. (fof)(y)
6. (gog)(y)

B Let x = {2,3, 6, 12, 24, 36} $x \leq y$ if x divides y. Find [8]

1. Maximal element
2. Minimal element
3. Chain
4. Antichain

C What is POSET ? [2]

OR

Q6. A Let A={1,2,3,4,5} and R={(1,4),(2,1), (2,5),(2,4),(4,3),(5,3),(3,2) }. Find the transitive closure by using Warshall's algorithm . [8]

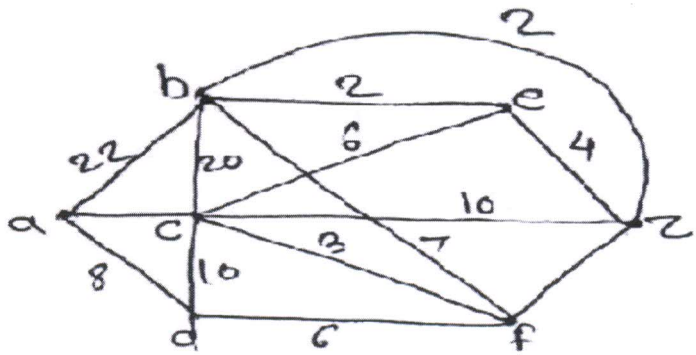
B Let A={1,2,3,4,5,6} and Π =[{1,2},{3,4,5},{6}] .Find the equivalence relation determined by Π .Also draw its diagraph. [8]

C What is the difference between relation & function ? [2]

SECTION – II

Q7. A State and prove Euler's formula for a connected planar graph of order *n*, size *e* and with *f* faces [6]

B Find the shortest path from A to Z by using Dijkstra's Shortest path algorithm. [8]



C List the application of graph theory. [2]

OR

Q8. A Define the following with an example with respect to graph theory. [8]
i) Isomorphic graph
ii) Bipartite graph
iii) Self complementary graph
iv) Planar graph

B Define Eulerian path and Eulerian circuit ? find under what conditions Km,n, the complete bipartite graph will have an Eulerian circuit ? Explain all cases. [8]

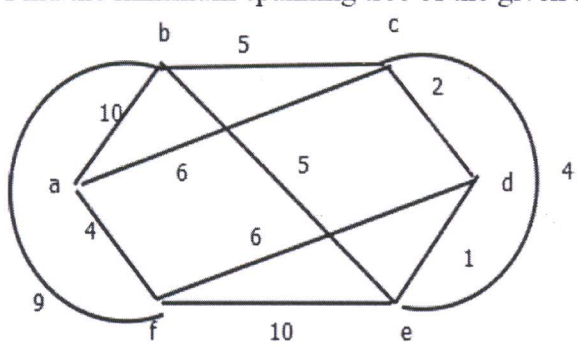
Q9. A Define the following terms with suitable example : [6]
(*i*) Rooted tree
(*ii*) Spanning tree
(*iii*) Level of the tree

B Use Huffman coding to encode the following symbol with the frequencies listed. A:0.08,B:0.010,C:0.12,D:0.15,E:0.20,F:0.35.List the prefix code. [6]

C Draw a binary tree for input data 200,100,300,50,150,250,400,10,75,125,175.Identify the root, leaf & interior nodes. [4]

OR

Q10. A Find the minimum spanning tree of the given figure by using Prim's algorithm [6]



B A binary tree has 10 nodes. The inorder and preorder traversals of the trees are as shown below. Construct the binary tree. [6]
Inorder : A B C E D F J G I H
Preorder : J C B A D E F I G H