[Total No. of Questions: 12]   **[Total No. of Printed Pages: 8]**

UNIVERSITY OF PUNE
[4362]-211
S. E. (Computer & I.T.) Examination - 2013
DISCRETE STRUCTURE (2008 Course)

[Time: 3 Hours]   **[Max. Marks: 100]**

SECTION -I

Q.1   A   Convert the following English statement in the symbolic from   6
- i)   If I am not studying maths and I go to a movie then I am in a good mood.
- ii)   If I am in good mood, then I will studying maths or I will go to a movie.
- iii) If I am not in good mood, then I will not go to a movie or I will study maths.
- iv)   I will go to a movie or I will not study maths if and only if I am in a good mood

B   In a town there are 2000 literate person ,of them 60 % news paper   6
A. 55% read newspaper B and 20% read neither A nor B. How many individuals read.
- (i)   Both the newspaper A and B?
- (ii)   Only one newspaper?

C   Determine whether the following arguments are valid or invalid.   6
- (i)   If Aaryan study hard, He will obtain first class. He will get a good job. Therefore if Aaryan study hard, he will get a good job.
- (ii)   If Geeta goes to class. She is on time. But Geeta is late. She will therefore miss the class.
- (iii) I am happy if my program runs. A necessary condition for the program to run is it should be error free. I am not happy. Therefore is not error free.

OR

Q.2   A   Prove by mathematical induction.   6
$$2 + 5 + 8 + \ldots\ldots\ldots + (3n-1) = n(3n+1)/2$$

B   Prove the following by using Venn Diagram.   6
- i) $A \oplus B \oplus C = (A \oplus B \oplus C)$
- ii) $(A \cap B \cap C) = A - [(A-B) \cup (A-C)]$
- iii) $A \cap B \oplus C = (A \cap B) \oplus (A \cap C)$

C   What is multiset? For a given multiset find the following operations   6
A={a,a,b,c,d,d,d,e}
B={a,b,d,f,g}

C={b,c,e,e,g,h,h}
D={a,d,d,e,f,f,g,h}
Find. (i)A U B   (ii)C ∩ B   (iii)A-D   (iv)B+C

Q. 3   A   Define the following terms with suitable example.   8
                    (i)Group
                    (ii)Subgroup
                    (iii)Ring
                    (iv)Integral Domain
        B   Let G={Even, Odd} and binary operation ⊕ is defined as .   4

⊕	Even	Odd
Even	Even	Odd
Odd	Odd	Even

        Show that (G,⊕)is an abelian group.

        C   Let (A,*) be a monoid such that for every x in A.x* x=e. where e   4
             is identity element. Show that (A,*) is an abelian group.
                                    OR
Q. 4   A   Define the following terms with suitable example.   8
             (i)Field
                    (ii)Monoid
                    (iii)Homomorphism
                    (iv)Automorphism

        B   Consider (3,4)parity check code. For each of the following   4
             received words.
             Find whether an error will be detected?
                 i)   0010
                 ii)   1001
                 iii) 1101
                 iv)   1010
                 v)   1111
                 vi)   0011

        C   What is hamming distance??Find the minimum distance of the   4
             following(2,5)encoding function e.
                    e(00)=00000
                        e(10)=00111
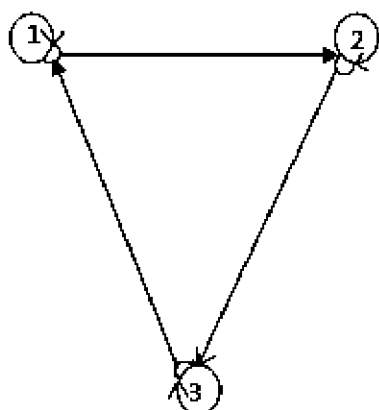   e(01)=01110
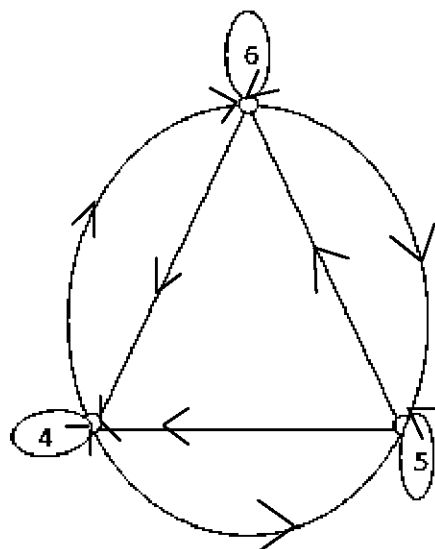   e(11)=11111

Q. 5   A   Determine whether the relation R whose diagraph is given below   6

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is an equivalence relation.

I)

ii)
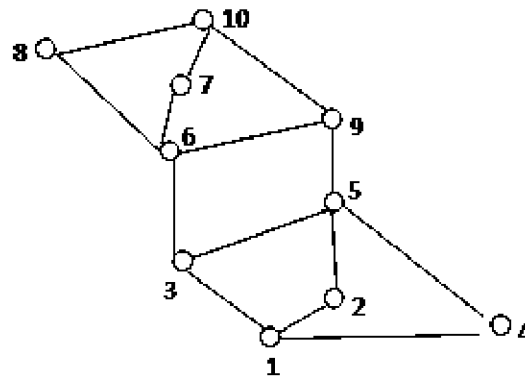

B   Let A={1,2,3,4} and R={(1,2),(2,4),(1,3),(3,2)}   5
Find the transitive closure of R by warshall's algorithm.

C   For A={1,2,3.....10}.Consider the POSET (A,R)whose hasse the   5
diagram below. Find
     i)   glb{2,3}
    ii)   glb{2,7}
   iii) glb{5,8}
   iv) lub{3,2}
    v)   lub{4,8}
   vi) lub{3,5}

OR

**Q. 6**   **A**   Solve the recurrence relation.   6
        (i)$a_n = 2a_{n-1} - a_{n-2}$ with initial conditions a1=1.5 and a2=3
        (ii) $a_n = -3a_{n-1} - 2a_{n-2}$ with initial conditions a1=-2 and a2=4.

  B   Identify the types of function for the following statement with   4
        justification
        i)   To each person on the earth assign the number which
             correspond to his age.
        ii) To each country assign the number of people living in the
             country.
        iii) To each book written by only one author, assign the author.
        iv) To each country having prime minister assign the prime
             minister.

  C   (c)Let A={1,2,3,4,5} and π={{1,2},{3},{4,5}}.Find the   6
        equivalence relation determined by π and draw the diagraph.

SECTION II

Q. 7   **A**   Define the following with an example with respect to graph   8
        theory.
        i)   Multi graph
        ii) Isomorphic graph
        iii) Bipartite graph
        iv) Self complementary graph
        v)   Planar graph

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B   Use Dijkstra algorithm to find the shortest path from a to z.   8
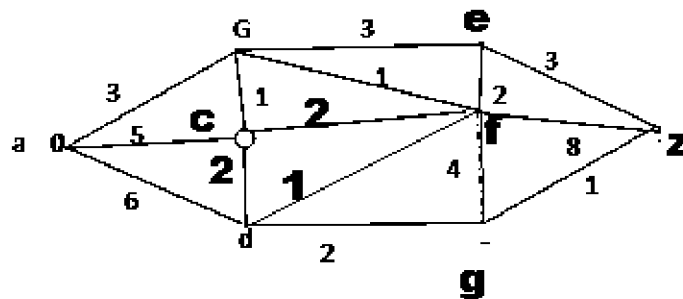
OR

Q. 8   A   State necessary and sufficient condition for the existence of   6
Hamilton path and Circuit in K_{MN} & K_N .

B   Show that a complete graph with n vertices consist of n(n-1)/2   5
edges.

C   Show that if G is connected planar graph with N vertices, E edges   5
and R regions the N-E+R=2

Q. 9   A   Define the following terms with reference to the tree.   6
        i)   Binary search tree
        ii)   M-ary tree
        iii) Tree traversal

B   Use Prim's algorithm to find the minimum spanning tree of the   5
give graph G (below).
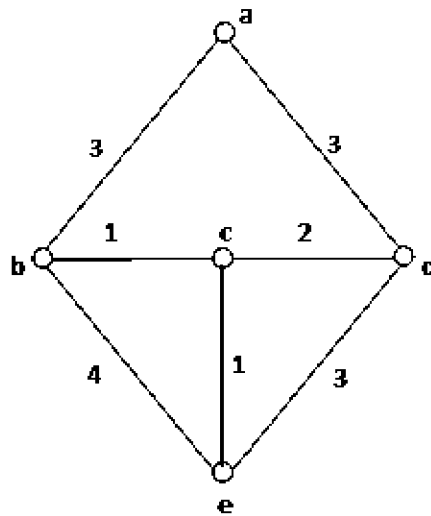
C Draw a binary tree for input data 5
200,100,300,50,150,250,400,10,75,125,175.Identify the root, leaf & interior nodes.

OR

Q. 10 A Determine the maximum flow in the following transport network 6
by using labeling procedure.
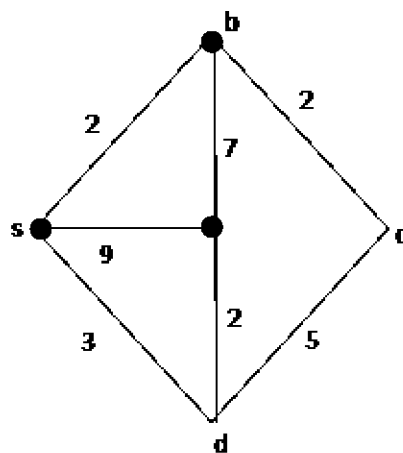
B Use Huffman coding to encode the following symbol with the 5
frequencies listed.
A:0.08,B:0.010,C:0.12,D:0.15,E:0.20,F:0.35.List the prefix code.

C Find the minimum spanning tree by using Kruskal's algorithm. 5
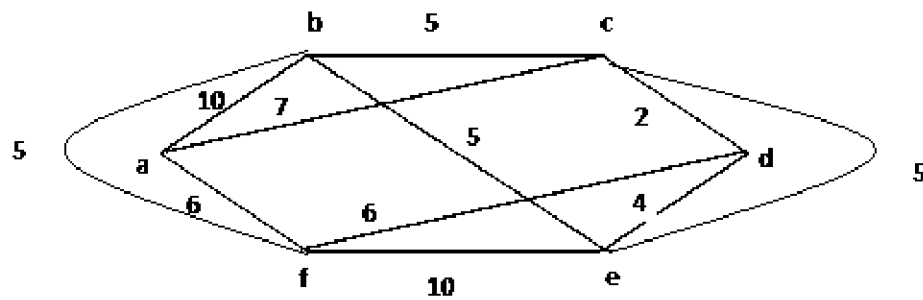
Q. 11   A   If repetition is not allowed how many 4 digits number can be   6
            formed with the digits 1,2,3,4,5,7,8?
            i)   How many are less than 5000?
            ii)   How many even digits can be formed?
            iii) How many odd digits can be formed?

        B   In how many ways 9 people can be seated at a round table if   6

            i)   They can sit anywhere?
            ii)   2 particular person must not sit next to each other?

        C   Five boys and five girls are to be seated in a row. In how many   6
            ways they can be seated if
            i)   All boys must be seated in the five left most seats.
            ii)   No two girls can be seated together
            iii) Mona and Kiran must be seated together.

                                    OR
Q. 12   A   Two dice are rolled together .Event A denotes that sum of   6
            numbers on top faces is even and event B denotes that there is a 4
            on at least one of the top faces. Find
                                (i)P(A U B)
                                (ii)P(A ∩ B)

B   A bag A contains 2 white and 4 black balls. Another bag B   6
contains 5 white and 7 black ball .A ball is transferred from bag A
to bag B ,then a ball is drawn from bag B. Find the probability that
it is white.

C   In a university 60 % professors are male and 40 % are females.   6
Also 50 % of male professors are and 60% of female professors
know computer programming. Find the probability that a
professor knowing computer programming is a female.