Unique Paper Code   : **32341202-OC**

Name of the Course   : B.Sc. (H) Computer Science (Old Course)

Name of the Paper   : Discrete Structures

Semester   : II

Duration   : 3 hrs

Maximum Marks   : 75

Admission Year   : **2015-18**

Instructions for Candidates

1.   All questions carry equal marks.

2.   Attempt any FOUR out of six questions.

Q1.   For the following graphs G1 and G2, determine whether G1 and G2 are isomorphic? Justify. Find the incidence matrix for the given graphs G1 and G2. Determine whether G1 and G2 are planar. If yes, redraw else, give reasons. Find out if there exists any Euler Path or Euler Circuit for the graphs G1 and G2. If it exists, write sequence of vertices for each of them. Tell whether it is possible to draw a tree for each graph G1 and G2 by removing an edge? Justify your answer.
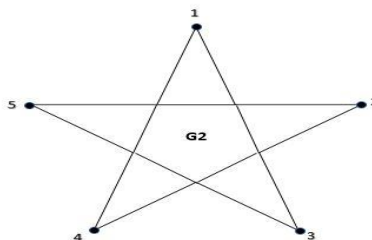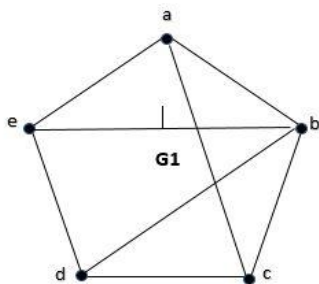
Q2. Use Master method to find asymptotic bounds for the following recurrence relation:

$$T(n) = 2T\left(\frac{n}{4}\right) + \sqrt{n}$$

Among 50 players, 26 got medals in first tournament and 21 got medal in second tournament for various categories. If 17 players did not get a medal in either tournament, how many players got a medal in both the tournaments?
If the number of players who got a medal in first tournament is equal to that in second tournament, if the total number of players who got medal in exactly one tournament is 40, and if 4 players did not get a medal in either tournament, determine the number of players, who got a medal in the first tournament only, who got a medal in the second tournament only, and who got a medal in both the tournaments.

Q3. Show all the steps of Insertion Sort to put the following list of items in an increasing order

5	2	7	4	9	3	6	1	8

Given that the number of comparison in insertion sort is n (n – 1) / 2.
Prove that it is $\Theta(n^2)$. Also find suitable values of C1, C2 and K.

Q4. Given a relation R on set A= {1, 2, 3, 5, 6, 10, 15, 30} such that

R = {(a, b), a is divisor of b and a ϵ A, b ϵ A}

Show that it is a POSET. Draw its digraph and Hasse Diagram.
Compute Maximal and Minimal element of Hasse Diagram.

Assume f(x) = x+3, g(x) = x-3 and h(x) = 4x, x ϵ R. Find the composition

(i) g o f (ii) h o f and (iii) f o h o g.

Q5. Find the total solution (homogenous and particular solution) of the given recurrence relation:

$$a_r - 4a_{r-1} + 4 a_{r-2} = 3r + 2^r$$

with $a_2 = 12$, $a_3 = 20$

Q6. Convert the following statement in symbolic form and show that it is a valid conclusion:

"If you send me the URL, then I will finish configuring the software. If you do not send me the URL, then I will go for a walk and If I go for a walk, then I will keep my blood pressure in control leads to the conclusion If I do not configure the software, then I will keep my blood pressure in control."

Find inverse, converse and contra-positive for the statement
"If you send me the URL, then I will finish configuring the software."

Consider the word "CLIMATE". Calculate in how many ways these letters can be arranged. Calculate in how many ways the letters can be arranged such that the vowels occur in odd places.