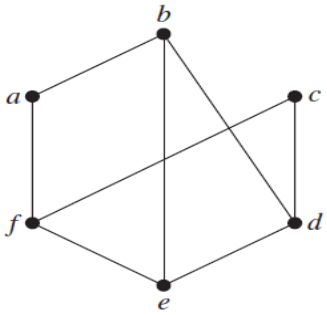
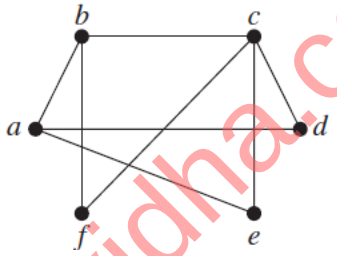
Unique Paper Code	: 32341202-OC
Name of the Course	: B. Sc. (Hons.) Computer Science (Old Course)
Name of the Paper	: Discrete Structure
Semester	: II
Duration	: 2 Hours
Maximum Marks	: 75
Year of Admission	: 2015-2017

Instructions for Candidates: Attempt Any Four questions. All Questions carry equal marks.

Q1. For the following given graphs G1 and G2, show whether G1 and G2 are bipartite? Find the incidence matrix for the given graphs G1 and G2. Determine whether G1 and G2 are planar, if yes, how many regions are there in each graph? Determine chromatic number of the given graphs?



G1



G2

For each of the following graph, give the value of n for which it is bipartite. K_n, C_n, W_n

Q2. Use Master method to find asymptotic bounds for the following recurrence relation:

$$T(n) = 2T\left(\frac{n}{4}\right) + \sqrt{n} + 24$$

(a) Find S^6a and $S^{-3}a$ for the following numeric function a_r

$$a_r = \begin{cases} 1 & 0 \le r \le 10 \\ 2 & r \ge 11 \end{cases}$$

Q3Dr Show all the steps of Bubble Sort to put the following list of items in an increasing order:

3	1	5	9	2	6	4	7	11	5

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

Q4. For the following given matrix A_R, Show A_R is a Partial Ordering Relation. Draw the digraph and Hasse diagram for given relation.

$$A_R = \begin{pmatrix} 1 & 0 & 1 & 1 & 1 \\ 0 & 1 & 1 & 1 & 1 \\ 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}$$

Assume $f(x) = 2x^2 + 10$ and $g(x) = x + 6$. Find the composition f o g and g o f.

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

$$a_r + 5\, a_{r-1} + 6\, a_{r-2} = 42 \cdot 4^r$$

with $a_2 = 278$, $a_3 = 962$

Q6. Convert the following statement in symbolic form:
S1: If a woman is married, she is happy.
S2: If a woman is happy, she lives longer.
Show that "Woman lives longer" is a valid conclusion. "If women is not married and either women is married or women is happy then women is happy." Prove that the given statement is a tautology. Also find inverse, converse and contra-positive for the given statement S1.

Consider the word "CORONAVIRUS". Calculate in how many ways these letters can be arranged. Calculate in how many ways the letters can be arranged such that the vowels should always come together.