## Answer All Questions

Time: 2 Hour   **(The figures in the right hand margin indicate marks.)**   **Total marks: 70**

1. You are given three vessels A, B and C of capacities 8, 5 and 3 gallons respectively. A is filled, **[14]** while B and C are empty. Divide the liquid in A into two equal quantities (Decanting Problem) i.e. Transform (8,0,0) state to (4,4,0) using graph.
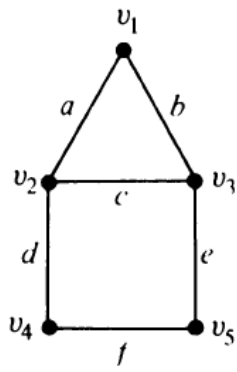
OR

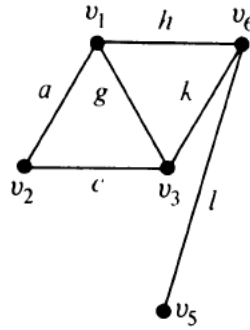In the following graph identify isolated vertices, series edges and pendant vertex.   **[14]**
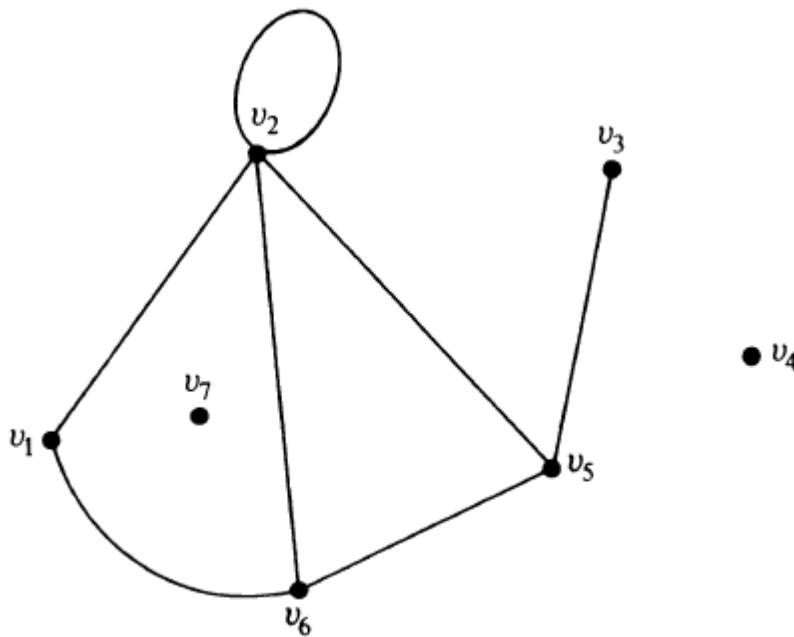
and prove that the number of vertices of odd degree in a graph is always even.

2. For the given graphs G_1 and G_2, find out the followings.   **[3.5 x 4=14]**

   (i) $G_1 \cup G_2$

   (ii) $G_1 \cap G_2$

   (iii) $G_1 \oplus G_2$

   (iv) $G_2 - v_3$

G_1 G_2

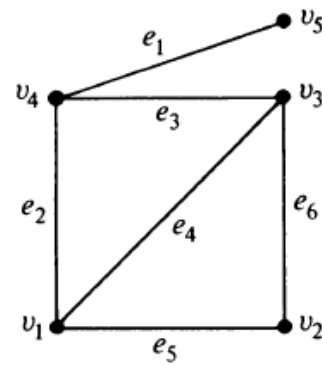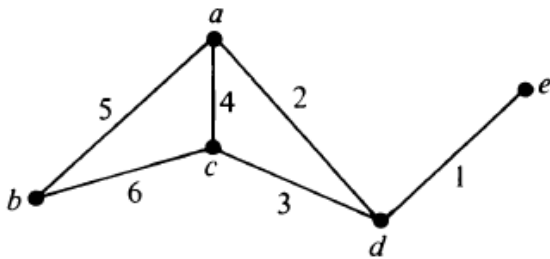**OR**
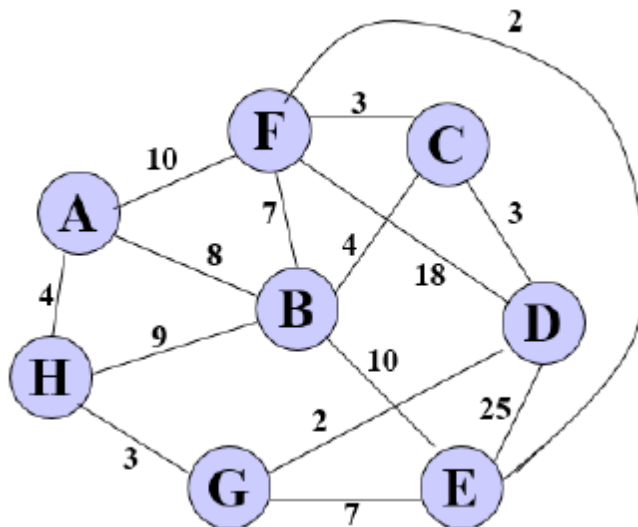
Show that the following two graphs are isomorphic   **[14]**

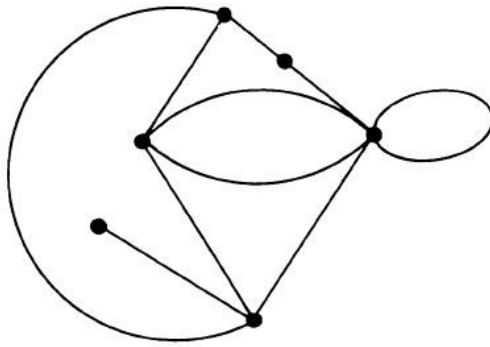3. Determine the minimum spanning tree of the following graph and find its rank and   **[14]**
   Nullity.

OR

Prove that a connected planar graph with *n* vertices and *e* edges has *e-n+2* regions.   **[14]**

4. Find the geometric dual of the following planar graph. **[14]**
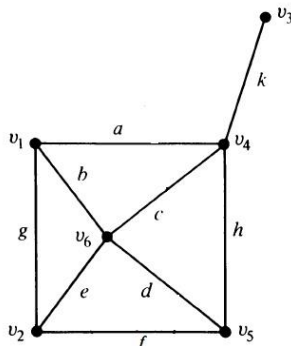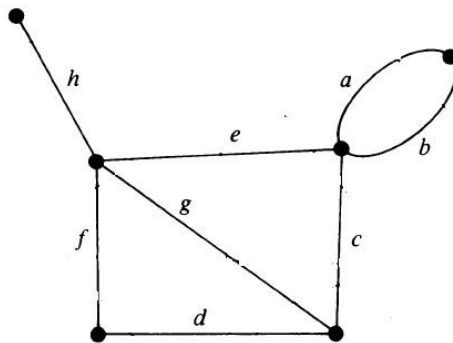

OR

Find the basis vectors of the circuit subspace of the following graph and show that the vectors **[14]** determined form a basis.

5. Find all fundamental circuits and cut sets of the following graph and show that the ring sum **[14]** of any two cut sets in this graph is either a third cut set or an edge disjoint union of cut sets.

OR

(a) If 4 Maths books are selected from 6 different Maths books and 3 English books are **[7+7=14]** chosen from 5 different English books, how many ways can the seven books be arranged on a shelf ?

(b) In how many ways 10 sweets of same colour, size and shape can be distributed among 6 children when there is no fair play ?