**SLR-SC – 7**

| Seat No. | |
|---|---|

**Set P**

**B.Sc. (ECS) – I (Semester – I) (CBCS Pattern) Examination, 2018**
**MATHEMATICS (Paper – VI)**
**Discrete Structures**

Day and Date : Thursday, 5-4-2018 Max. Marks : 70
Time : 10.30 a.m. to 1.00 p.m.

***N. B.*** *: 1)* ***All*** *questions are* ***compulsory****.*
*2) Figures to the* ***right*** *indicate* ***full*** *marks.*
*3)* ***Use*** *of calculator is* ***allowed****.*

1. Choose the correct alternative : **14**

1) If in adjacency matrix of a graph G, all the diagonal entries are zero and all the non diagonal elements are either 0 or 1 then graph G is _____ graph.
   a) Simple b) Pseudo c) Multi d) Complete

2) A null graph on 5 vertices is _____ regular graph.
   a) 4 b) 5 c) 0 d) 1

3) Spanning subgraph of a graph G is always _____ subgraph.
   a) Vertex deleted
   b) Edge deleted
   c) Both vertex deleted and edge deleted
   d) Neither vertex deleted nor edge deleted

4) If $G_1(V_1, E_1)$ and $G_2(V_2, E_2)$ be the two graphs then vertex set of the graph $G_1 \oplus G_2$ is _____
   a) $V_1 \oplus V_2$ b) $V_1 \cap V_2$ c) $V_1 \cup V_2$ d) $V_1 \times V_2$

5) A walk in which no vertex is repeated is called as _____
   a) Path b) Trial c) Circuit d) Tour

6) If a connected graph G has 4 isthmus (cut edge) then edge connectivity of G is _____
   a) 0 b) 1 c) 2 d) 3

**P.T.O.**

7) Travelling salesman problem is a particular case of _____ graph.
   a) Eulerian b) Hamiltonian
   c) Both a) and b) d) Neither a) nor b)

8) A closed path which covers all the vertices of a connected graph G is called as _____
   a) Eulerian path b) Eulerian circuit
   c) Hamiltonian path d) Hamiltonian circuit

9) A connected graph in which there exists exactly one path between any two vertices is called as _____
   a) Tree b) Hamiltonian graph
   c) Eulerian graph d) None of these

10) _____ algorithm is used to find shortest spanning tree.
   a) Dijkstra's b) Fleury's c) Warshall's d) None of these

11) In a binary tree, a vertex of degree 2 is known as _____
   a) Root b) Internal vertex
   c) Intermediate vertex d) Pendant vertex

12) Order of the recurrence relation $a_n + 3a_{n-2} + 5a_{n-4} = 0$ is _____
   a) 0 b) 1 c) 2 d) 4

13) Number of edges in a graph having 3 vertices of degree 5, 1 vertex of degree 3 and 2 vertices of degree 3 are _____
   a) 24 b) 17 c) 11 d) None of these

14) Order of adjacency matrix of a graph, having 4 vertices and 7 edges is _____
   a) 4 × 7 b) 7 × 4 c) 4 × 4 d) 7 × 7

2. Attempt **any seven** of the following : **14**

1) Define binary tree with suitable example.
2) Define Eulerian trail and Hamiltonian path.
3) Define edge connectivity of a connected graph.
4) Define spanning subgraph.
5) Draw the graph $K_4$ and $K_{3,3}$.
6) State principle of inclusion-exclusion for three sets.

7) Define multi graph. Give one example.

8) Define linear recurrence relation with constant coefficients.

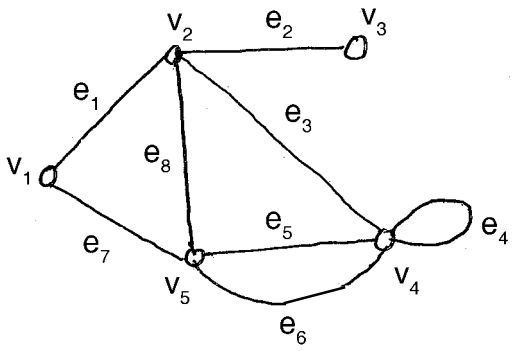
9) Draw a graph which is Hamiltonian but not Eulerian.

3. A) Attempt **any two** of the following : **10**

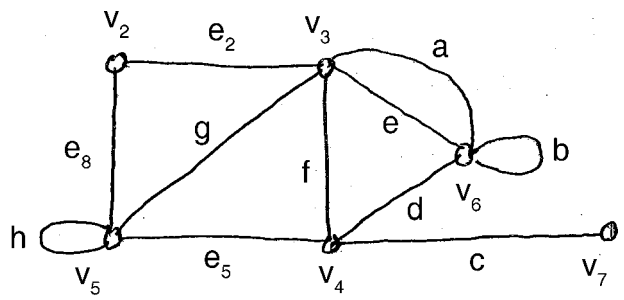
1) Let G be a graph with 'p' number of vertices, 'r' of which have degree 'K' and others have degree (K + 1). Prove that r = p(K + 1) – 2q, where 'q' is the number of edges in G.

2) Write a brief note on Koningberg's seven bridge problem.

3) From the following graphs $G_1$ and $G_2$, draw the graph $G_1 \oplus G_2$.




$G_1$




$G_2$

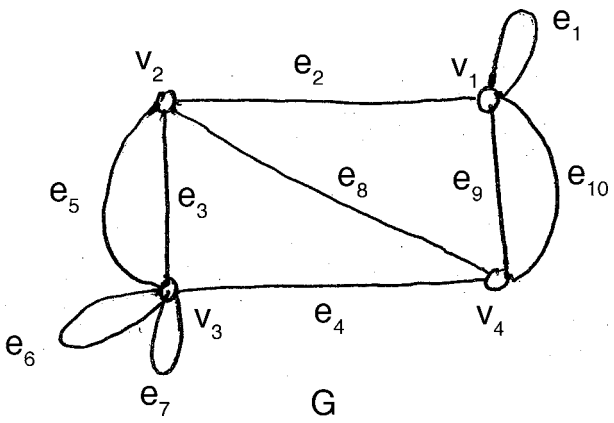
B) From the following graph G, draw the subgraphs : **4**

i) $G - V_1$

ii) $G - \{e_2, e_4\}$

iii) Vertex disjoint subgraphs

iv) Edge disjoint subgraphs.




G

4. Attempt **any two** of the following : **14**

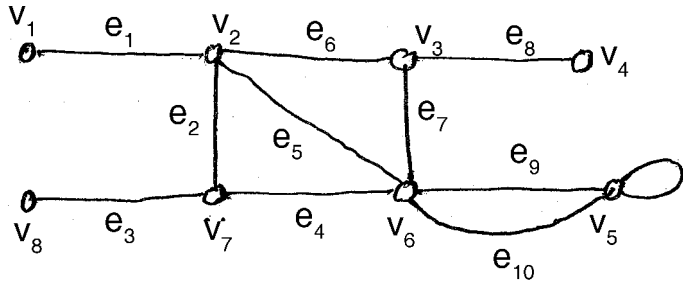
1) Define :

i) Isthmus

ii) Cut vertex

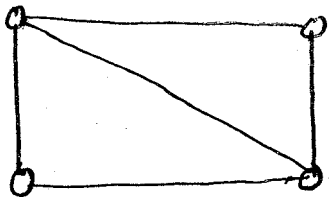
iii) Vertex connectivity.

Hence find all isthmus and cut vertex of the following graph G. Also write its vertex connectivity.

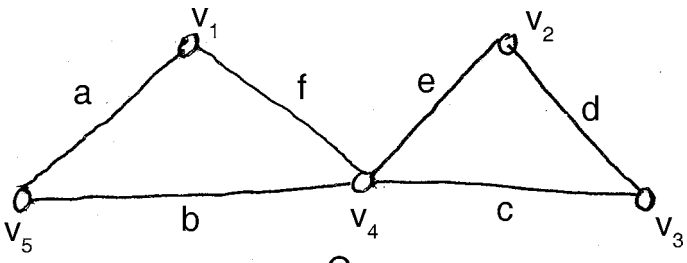



'G'

2) Define shortest spanning tree. Hence draw all possible spanning trees of the following connected graph G.



3) Write Fleury's algorithm. Hence find Eulerian circuit in the following connected graph G, by using Fleury's algorithm.

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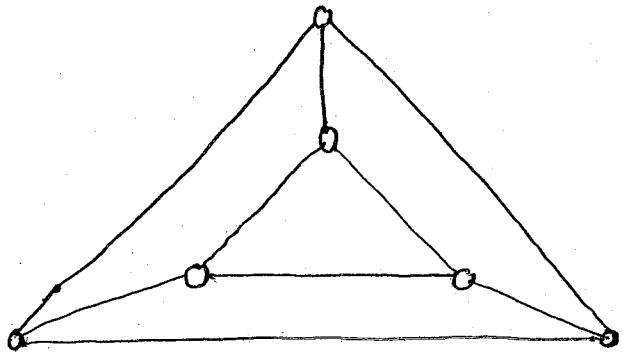
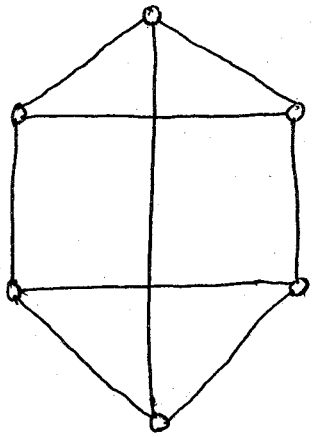
5. Attempt **any two** of the following : **14**

1) Define self complementary graph. Hence prove that in a self complementary graph, the number of vertices are of the type 4K or 4K + 1, where 'K' is any integer.

2) Determine whether the following graphs are isomorphic or not ?

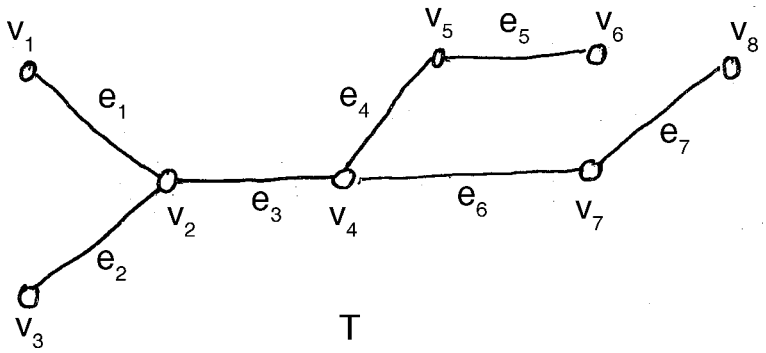


$G_1$



$G_2$

3) Define eccentricity of a vertex, radius of a tree, diameter of a tree. Hence find eccentricity of all vertices, centre, radius of the following tree :

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