H Roll No. .....

TCS–304

B. TECH. (CSE) (THIRD SEMESTER) END SEMESTER EXAMINATION, 2018

GRAPH THEORY

Time : Three Hours

Maximum Marks : 100

Note : (i) This question paper contains five questions with alternative choice.

(ii) All questions are compulsory.

(iii) Instructions on how to attempt a question are mentioned against it.

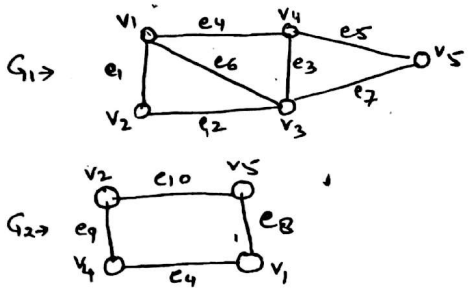
(iv) Each part carries **ten** marks. Total marks assigned to each question are **twenty.**

1. Attempt any *two* questions of choice from (a), (b) and (c). (2×10=20 Marks)

(a) Define the following with example :

Regular graph, Euler graph, Complete, graph, Star graph and Cycle graph.

(b) Find the Union, Intersection and Ring Sum of the following graphs ?



(c) Explain a Bipartite-graph and complete bipartite with example. What is its Chromatic Number ? Draw $K_{4,7}$

2. Attempt any *two* questions of choice from (a), (b) and (c). (2×10=20 Marks)

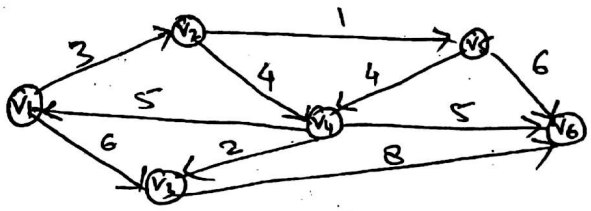
(a) What is a tree ? Why it is called minimally connected ? Draw all labelled trees of 3 vertices.

(b) Prove that a disconnected graph G without self-loops and parallel edges with n vertices and k components can have at most $(n-k)(n-k+1)/2$ edges.

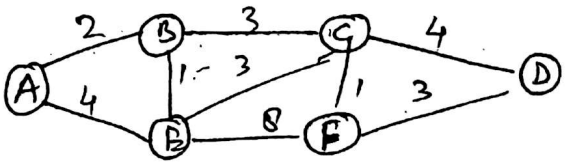
(c) Write short notes on Binary Trees, Full Binary Trees and Binary Search Trees.

3. Attempt any *two* questions of choice from (a), (b) and (c). (2×10=20 Marks)

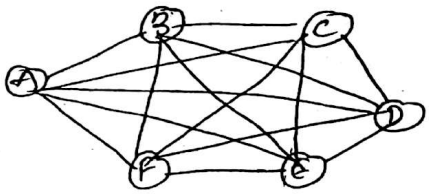
(a) Find the shortest path from V_2 using Dikjstra's algorithm in the network given below :



(b) What is a spanning tree and minimal spanning tree ? Find the minimal spanning tree using Kruskal's algorithm in the graph given below ?

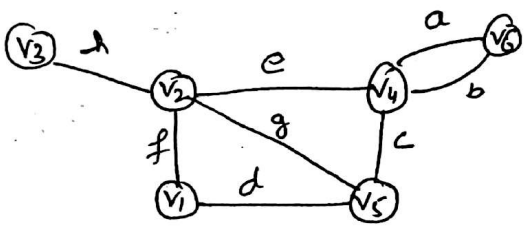


(c) What is planar graph ? Identify that the given graph is planar or not. If not, find the crossing number.



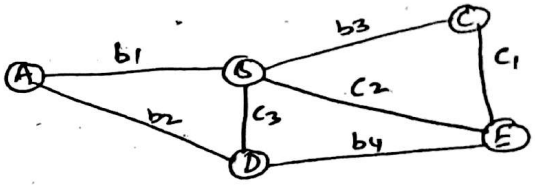
4. Attempt any *two* questions of choice from (a), (b) and (c). (2×10=20 Marks)

(a) Consider the following graph and find the Incidence Matrix, Adjacency Matrix, Circuit Matrix and Path Matrix (V_1, V_6).



(b) What are Fundamental Circuits and Fundamental Cutsets ? Consider the graph given below with b_1, b_2, b_3, b_4 as branches of spanning tree and c_1, c_2, c_3 as chords.

Find the Fundamental Circuit and cutest matrix :



(c) If B is a circuit matrix of a connected graph G with e edges and n vertices, then show that rank of $B = e - n + 1$.

5. Attempt any *two* questions of choice from (a), (b) and (c). (2×10=20 Marks)

(a) What is a Chromatic Polynomial ? Find Chromatic Polymial for K_4.

(b) An m-vertex graph is a tree if and only if its chromatic polynomial is given by $P_m(n) = n\,(n-1)^{m-1}$.

(c) What is coloring of graph ? Explain four colors problem with example.