PRESIDENCY UNIVERSITY, BENGALURU

SCHOOL OF ENGINEERING

Weightage: 20 %   Max Marks: 40   Max Time: 1 hr.   Saturday, 22nd September, 2018

TEST – 1

Odd Semester 2018-19   Course: **CSE 209 Graph Theory and Combinatorics**   V Sem. CSE

Instruction:

(i) *Read the question properly and answer accordingly.*
(ii) *Question paper consists of 3 parts.*
(iii) *Scientific and Non-programmable calculators are permitted.*

Part A

(3 Q x 4 M = 12 Marks)

1. Define a graph and degree of vertex of a graph. Prove that in every graph the number of vertices of odd degree is even.

2. Suppose that in a group of 5 people: A, B, C, D and E .The following pairs of people are acquainted with each other

   - A and C
   - A and D
   - B and C
   - C and D
   - C and E

   a) Draw a graph G to represent this situation

   b) List the vertex set and edge set

   c) Draw an adjacency matrix for G

3. Define

   - Vertex connectivity number
   - Edge connectivity number
   - Determine the relation between the vertex connectivity ,the edge connectivity and the minimum degree of a graph G
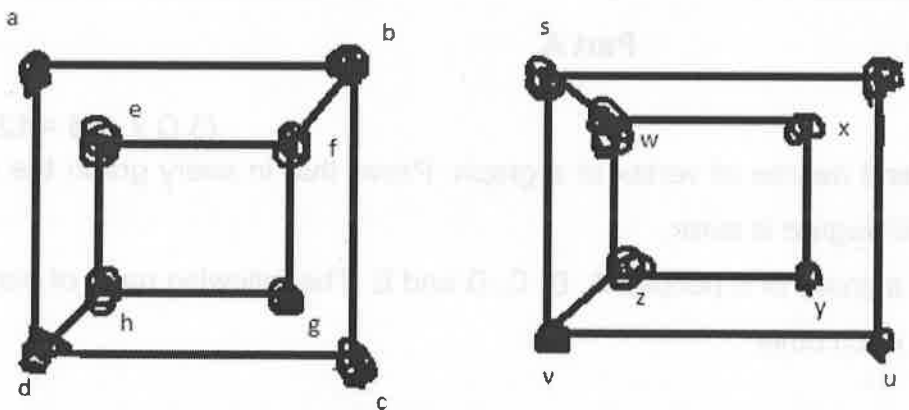
Part B

4. a) Prove the graphs K5 and K3,3 are non-planar.

   b) Define the chromatic number of a graph.

5. Define an Euler circuit and Euler path in an undirected graph with an example. And describe the famous Konigsberg seven bridge problem
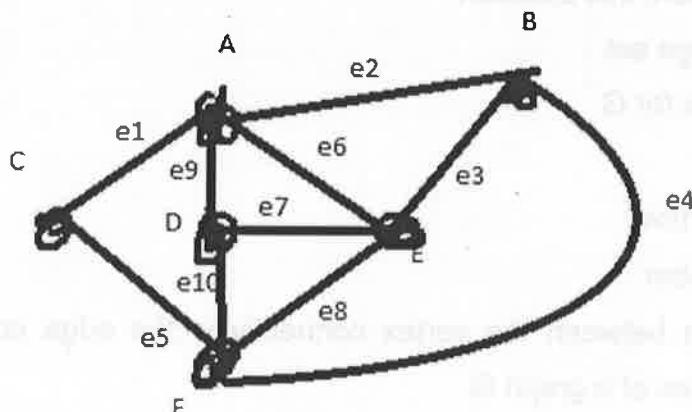
Part C

6. a) Determine whether graph G and H are isomorphic or not , justify your answer

   b) Define the following terms

   - Hamilton path
   - Hamilton circuit
   - Is there a Hamilton path for this graph? Give reasons

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TEST 2

Odd Semester: 2018-19

Course Code: CSE 209

Course Name: Graph Theory and Combinatorics

Branch & Sem : CSE & V Sem

Date: 24 November 2018

Time: 1 Hour

Max Marks: 40

Weightage: 20%

Instructions:

   (i)   Read the question properly and answer accordingly.

   (ii)   Question paper consists of 3 parts.

   (iii) Scientific and Non-programmable calculators are permitted.

Part A

Answer **all** the Questions. **Each** question carries **eight** marks.   (2x8=16)

1. A) Prove the properties of tree with a suitable example
   - A tree with n vertices has n-1 edges
   - A graph is a tree if and only it is minimally connected

   B) Write short notes on full binary tree and complete binary tree. Give suitable examples for each.

2. Prove full m-ary tree with i internal vertices has n=mi+1 vertices and L=(m-1)i+1 leaves with an suitable example.

Part B

Answer **all** the Questions. **Each** question carries **eight** marks.   (2x8=16)

3. Draw BST by inserting the below numbers from left to right
   11, 6, 8, 19, 4, 10, 5, 17, 43, 31 and show 2 trees that can be the result after removal of 11

4. In-order : 4,10,12,15,18,22,24,25,31,35,44,50,66,70,90
   Pre-order: 25,15,10,4,12,22,18,24,50,35,31,44,70,66,90
   Construct the binary tree and write the Post-order sequence

Part C

Answer **any one** Questions. Question carries **eight** marks.   (1X8=8)

5. A) List out the differences between DFS & BFS
   B) Perform BFS for the below graph: Start at node 0
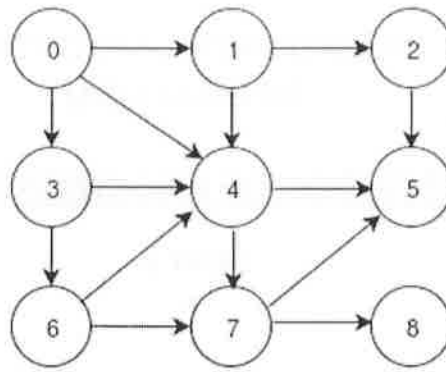
<div align="center">(or)</div>

6. Construct Huffman prefix code for the symbols a, o, q, u, y, z that occur with frequencies 20,28,4,17,12,7 respectively. And calculate the total message length?

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END TERM FINAL EXAMINATION

Instructions:

(i)   Read the question properly and answer accordingly.
(ii)   Question paper consists of 3 parts.
(iii)   Scientific and Non-programmable calculators are permitted.

Part A

Answer **all** the Questions. **Each** question carries **five** marks.   (4Qx5M=20)

1. Define tree. Prove that in every tree T=(V,E), |V|=|E|+1
2. Define the following terms. Give one example each
   a) Rooted tree   b) Binary Search Tree
3. Explain a Spanning tree and its applications.
4. Find the generating function for each of the sequence 1,1,1,1…. and 2,2,2,2….

Part B

Answer **all** the Questions. **Each** question carries **ten** marks.   (4Qx10M=40)

5. If a tree has 5 vertices of degree 2, 3 vertices of degree 3 , 4 vertices of degree 4 then how many leaves are there in that tree? And draw a resultant tree.
6. Use Dijkstra Algorithm to find the shortest route from A to all other vertices in the graph shown below in figure 1 and label the corresponding linkages and nodes. Show your work neatly.
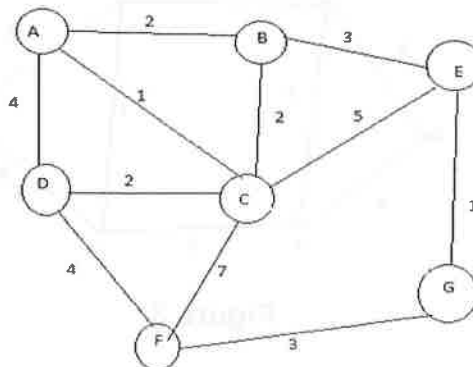
Figure 1

7. a) Compare Prim's and Kruskal's algorithm
   b) Use Prim's algorithm to find a minimum spanning tree for the weighted graph shown below in figure 2
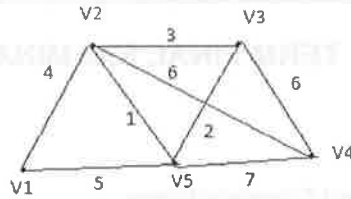

Figure 2

8. How many integers between 1 and 300(inclusive) are
   - Divisible by at least one of 3, 5, 7?
   - Divisible by 3 and by 5 but not by 7?

Part C

Answer **all** the Questions. **Each** question carries **ten** marks.   (2Qx10M=20)

9. Consider the following table of symbol frequencies

Symbol	A	B	C	0	1	2	$
Frequency	0.10	0.03	0.14	0.4	0.22	0.04	0.07

   - Build the Huffman code tree
   - Use the Huffman tree to find the code word for each symbol
   - Encode with Huffman the sequence 01$cc0a02ba10

10. State the Max Flow- Min Cut Theorem. For the network shown below in figure 3, determine the maximum flow between the vertices A and D by identifying the cut-set of minimum capacity.
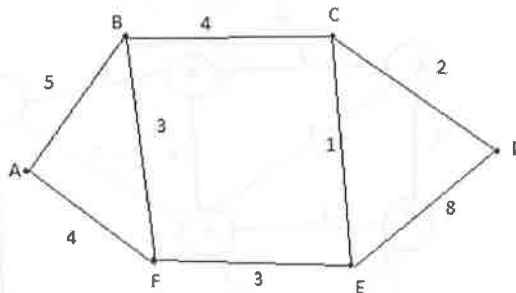

Figure 3