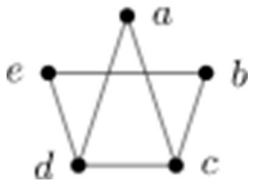
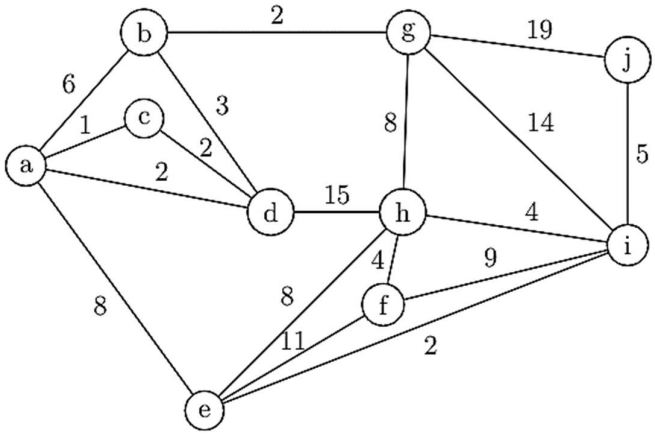
BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: BTech **SEMESTER : VI**
BRANCH: CSE **SESSION : SP/2023**

SUBJECT: CS307 GRAPH THEORY

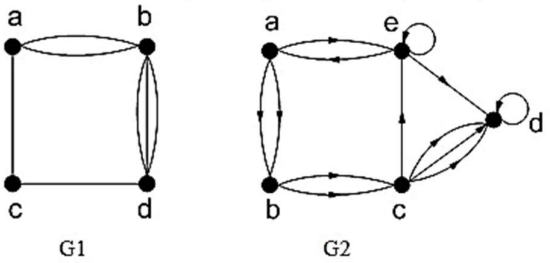
TIME: 3 Hours **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

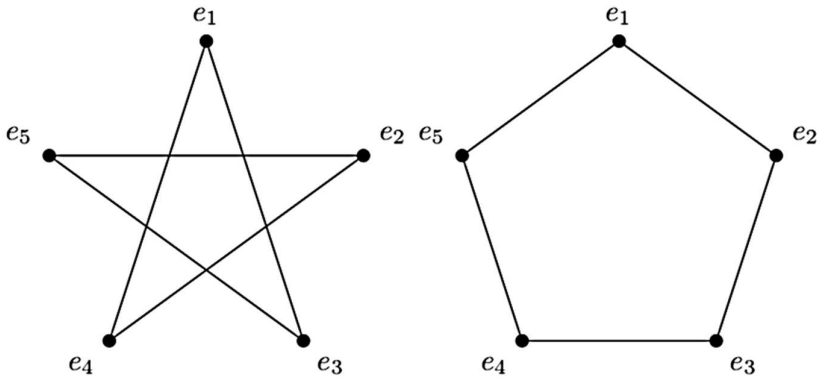
			CO	BL
Q.1(a)	Are the two graphs below equal? Are they isomorphic? If they are isomorphic, give the isomorphism. If not, explain. Graph 1: V={a,b,c,d,e}, E={{a,b},{a,c},{a,e},{b,d},{b,e},{c,d}}. Graph 2:  	[4]	1	2
Q.1(b)	Which of the following graphs contain an Euler path? Which contain an Euler circuit? a. K4 b. K2,7 c. C7	[3]	1	2
Q.1(c)	Below is a graph representing friendships between a group of students (each vertex is a student and each edge is a friendship). Is it possible for the students to sit around a round table in such a way that every student sits between two friends? 	[3]	4	4
Q.2(a)	 Find chords of minimum spanning tree of above graph.	[5]	3	3

PTO

Q.2(b)	Let G be an undirected connected graph with distinct edge weights. Let e_{max} be the edge with maximum weight and e_{min} be the edge with minimum weight. a. Justify whether MST consist e_{min} b. Justify whether MST consist e_{max}	[5]	3	3
Q.3(a)	The graph G has 6 vertices with degrees 2,2,3,4,4,5. How many edges does G have? Could G be planar? If so, how many faces would it have. If not, explain.	[2]	3	4
Q.3(b)	Is it possible for a planar graph to have 6 vertices, 10 edges and 5 faces? Explain.	[2]	3	5
Q.3(c)	A graph is planar if and only if, (a) If does not contain subgraphs homeomorphic to K_5 and $K_{3,3}$. (b) It does not contain subgraphs isomorphic to K_5 or $K_{3,3}$. Which option is correct? Justify your answer.	[2]	3	5
Q.3(d)	Write an algorithm for finding clique in a graph. Explain your steps with example.	[4]	2	3
Q.4(a)	Find incident matrix, Adjacency matrix, Adjacency list of given graphs.	[3+2]	2	2

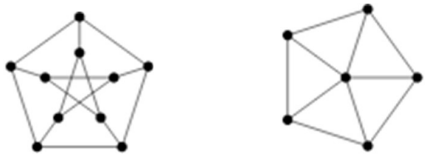


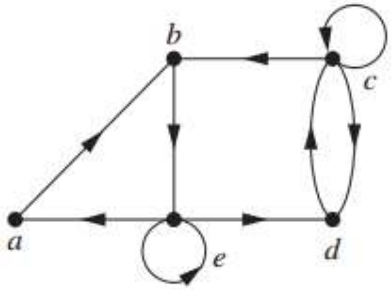
Q.4(b)		[5]	3	4



Proof the above graphs are isomorphic using adjacency matrix method.

Q.5(a)	You have a set of magnetic alphabet letters (one of each of the 26 letters in the alphabet) that you need to put into boxes. For obvious reasons, you don't want to put two consecutive letters in the same box. What is the fewest number of boxes you need (assuming the boxes are able to hold as many letters as they need to)?	[2]	4	5
Q.5(b)	Find the chromatic number of each of the following graphs.	[2]	3	3



Q.5(c)	Show that in a directed graph where every vertex has the same number of incoming as outgoing paths there exists an Eulerian path for the graph.	[2]	3	2
Q.5(d)	Find circuit matrix of given graph. 	[4]	4	3

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