

1. Give the definition of the following terms. (2 points each)

- (a) Induced subgraph
- (b) Isomorphic graphs
- (c) Graph minor
- (d) Eccentricity of a vertex
- (e) Adjacency matrix of a graph

2. Answer the following questions and explain your **answer**. (4 points each)

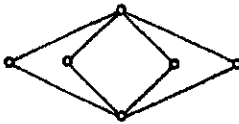
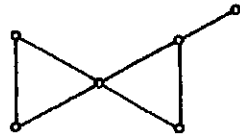
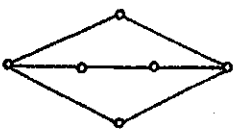
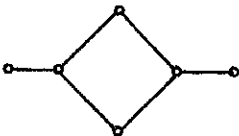
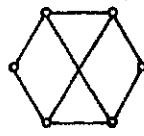
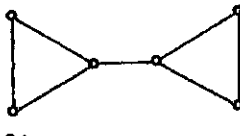
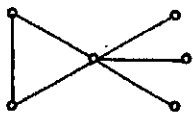
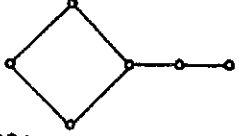
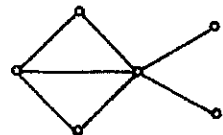
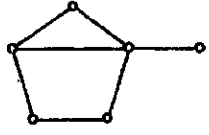
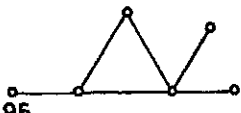
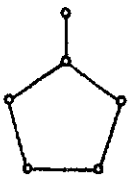
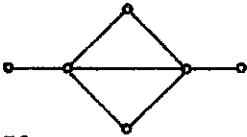
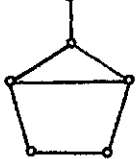
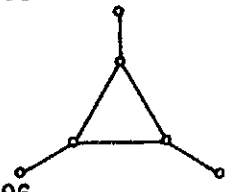
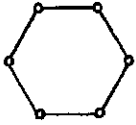
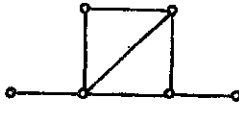
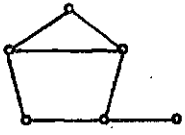
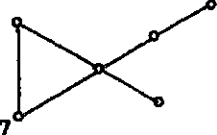
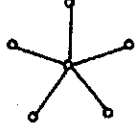
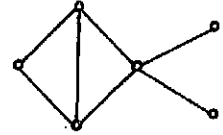
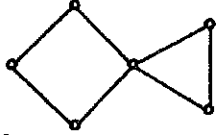
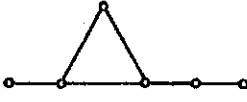
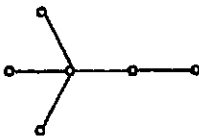
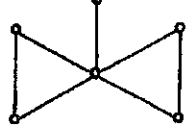
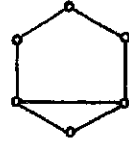
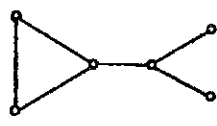
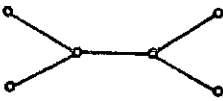
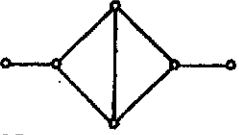
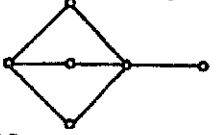
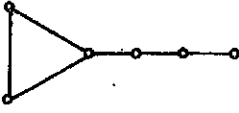
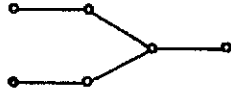
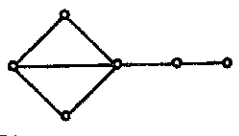
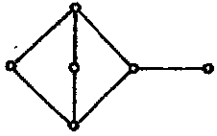
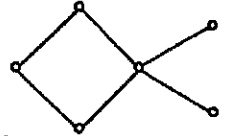
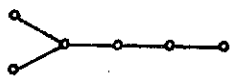
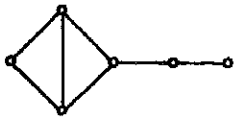
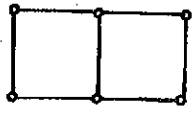
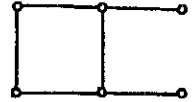
- (a) Find a 2-connected graph G with $\text{diam}(G) = 13$ and $\text{rad}(G) = 7$.
- (b) Find a graph G with $\delta(G) = 10$, $\kappa(G) = 5$ and $\kappa_1(G) = 8$.
- (c) Find the number of 3-cycles in a graph G by using its adjacency matrix.
- (d) Find the number of non-isomorphic graphs of order 6 and size 7.
- (e) Does Petersen graph contain a Hamilton cycle?
- (f) Let G be a graph of order 100 and $\delta(G) = 51$. Is G a Hamiltonian graph?

3. Prove two of the following three statements. (8 points each)

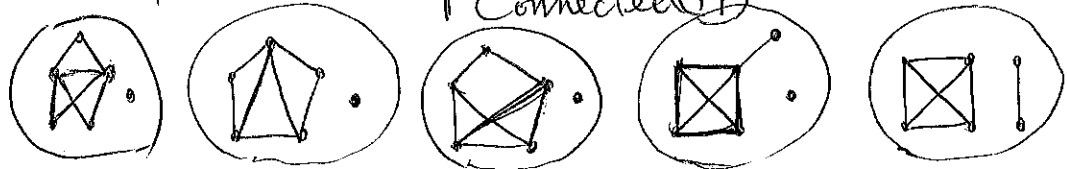
- (a) A connected graph G has an Eulerian circuit if and only if the degree of each vertex is even.
- (b) Let G be a connected graph. Then, the diameter of G is at least 3 implies that the diameter of the complement of G is at most 3.
- (c) If G is a graph of order n and size larger than $\lfloor n^2/4 \rfloor$, then G contains a triangle C_3 .

24 non-isomorphic graphs of order 6 and size 7

Table 1. (contd.)

			
73	83	93	103
			
74*	84	94	104
			
75	85	95	105
			
76	86	96	106
			
77	87	97	107
			
78	88	98	108
			
79	89	99	109
			
80	90	100	110
			
81	91	101	111
			
82	92	102	112

Connected (19)



← Dis-connected (5)