

21U605

(Pages: 3)

Name:

Reg. No:

SIXTH SEMESTER B.Sc. DEGREE EXAMINATION, APRIL 2024

(CBCSS-UG)

(Regular/Supplementary/Improvement)

CC19U MTS6 E01 / CC20U MTS6 E01 – GRAPH THEORY

(Mathematics – Elective Course)

(2019 Admission onwards)

Time: 2.00 Hours

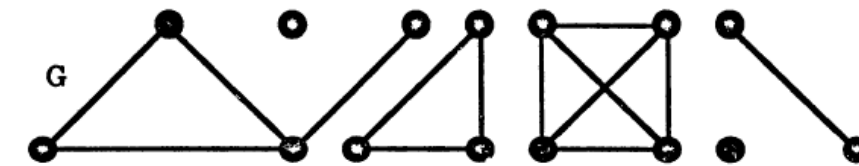
Maximum: 60 Marks

Credit: 2

Section A

Answer all questions. Each question carries 2 marks.

1. Prove that it is impossible to have a group of nine peoples at a party such that each one knows exactly five of the others in a group.
2. What is meant by k -regular graph? The complete graph K_n is regular.
3. State first theorem of graph Theory.
4. Write $\omega(G)$ for the following graph G .



5. Draw the graph having the adjacency matrix $\begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 1 \\ 1 & 1 & 0 \end{bmatrix}$
6. State True/ False with proof or counter example for the statement “If for every pair of distinct vertices u and v of a graph G there is precisely one path from u to v then G is a tree.”
7. Let G be an acyclic graph with 550 edges and 50 connected components then what is the number of vertices of G ?
8. Let G be a connected graph with 17 edges then what is the maximum possible number of vertices of G ?
9. Define the terms (a) Trail (b) Path.
10. State Jordan curve theorem
11. Let T be a tree with 1000 vertices then what is the number of edges of G ?
12. Define an Eulerian graph, give an example.

(Ceiling: 20 Marks)

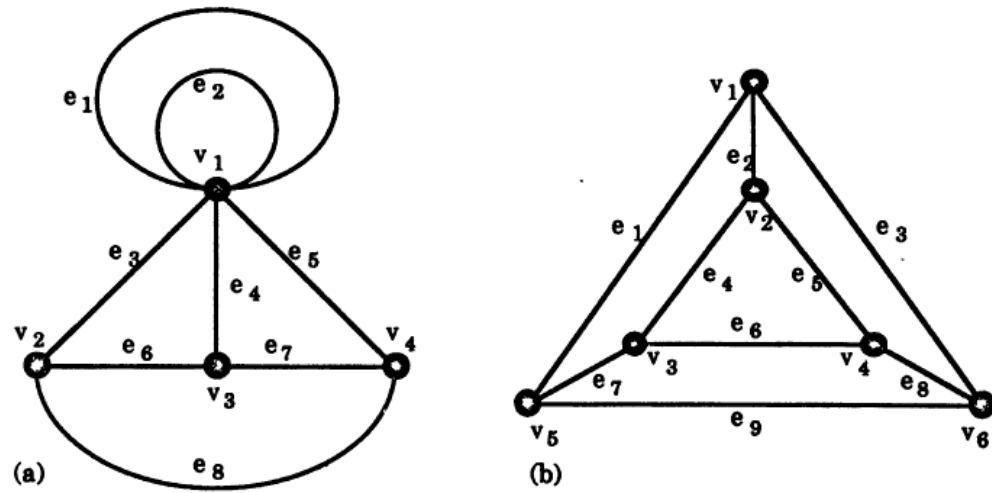
(1)

Turn Over

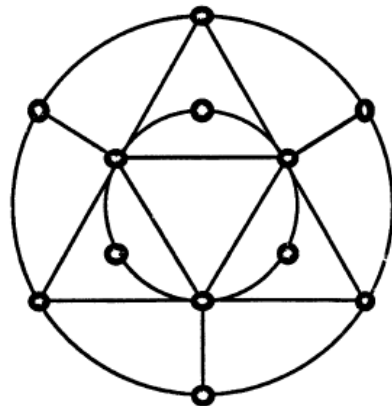
Section B

Answer *all* questions. Each question carries 5 marks

13. Given any two vertices u and v of a graph G , prove that every $u - v$ walk contains a $u - v$ path.
14. Prove that any tree T with at least two vertices has more than one vertex of degree one.
15. An edge e of a Graph G is a Bridge if and only if e is not a part of any cycle in G .
16. Write down the adjacency matrix of the following two graphs using the ordering of the vertices and edges given.



17. Let G be a graph with n vertices, $n \geq 2$. Prove that G has at least two vertices which are not cut vertices.
18. A Graph G is connected if and only if it has a spanning tree.
19. Verify Eulers formula for the following plane graph



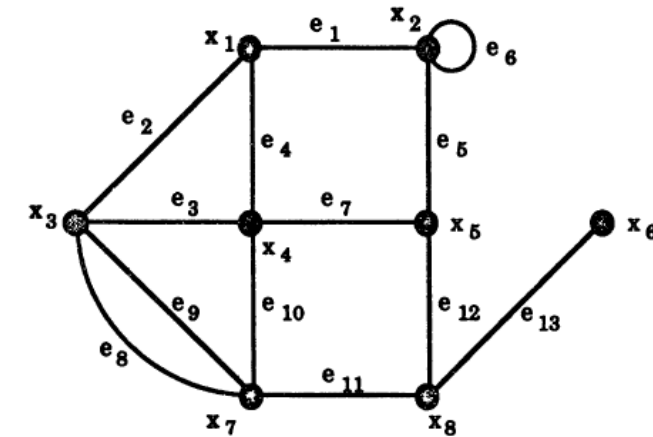
(Ceiling: 30 Marks)

(2)

Section C

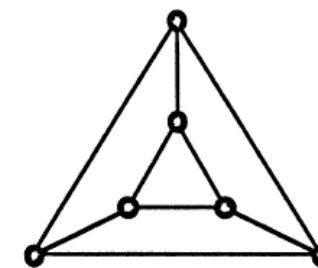
Answer any *one* question. The question carries 10 marks.

20. G is a non-empty graph with at least two vertices. Then show that G is bipartite if and only if it has no odd cycles.
21. (a) Consider the graph



Compute the following:

- (i) $G - U$ where $U = \{x_1, x_3, x_4, x_8\}$
 - (ii) $G - F$ where $F = \{e_1, e_3, e_5, e_7\}$
 - (iii) $G[U]$ where $U = \{x_1, x_3, x_4, x_7\}$
 - (iv) Find a subgraph H of G which is isomorphic to K_3
 - (v) Is there is a subgraph of G isomorphic to K_4 .
- (b) Find the closure of the following graph and check whether it is Hamiltonian or not?



(1 × 10 = 10 Marks)

(3)