TB24511B

Reg. No.........................

Name.............................

B. Sc. DEGREE (C.B.C.S.S.) EXAMINATION, NOVEMBER 2024
(2016 & 2017 Admission Supplementary)
SEMESTER V- CORE COURSE (MATHEMATICS)
MT5B08B - GRAPH THEORY

Time: Three Hours **Maximum Marks: 80**

PART A

I. Answer all the questions. Each question carries 1mark.

1. State True or False: "Every trail is a path."
2. Draw the complement of K_3
3. Give an example of a tree with 5 edges.
4. Give an example of a complete bipartite graph.
5. Give an example of a perfect matching.
6. Define a tournament.

(6x1 = 6)

PART B

II. Answer any seven questions. Each question carries 2 marks.

7. Draw two spanning subgraphs of K_4
8. Find the radius and diameter of the Petersen graph.
9. Define incidence matrix of a graph. What is the sum of the elements of its i^{th}row?
10. Let G be a connected graph. Then prove that G is a tree if and only if for every edge of Gis a bridge.
11. State the first theorem of Digraph theory.
12. Define closure of a simple graph.
13. State Redei's theorem.
14. Define cut vertex of a graph with an example.
15. Define Hamiltonian graph with an example.
16. Define an Euler digraph.

(7x2 = 14)

PART C

III. Answer any five questions. Each question carries 6 marks.

17. For any two vertices u and v of a graph G, prove that every u-v walk contains a u-v path.
18. Explain Chinese Postman Problem.
19. Define closure of a graph and prove that a simple graph G is Hamiltonian if and only if its closure is Hamiltonian.

20. Let D be a weakly connected digraph with at least two vertices. If D has two vertices u and v such that od(u) = id(u) + 1 and id(v) = od(v) +1 and, for all other vertices w of D, od(w) = in(w) then prove that D has a directed Euler trail
21. Explain the Personnel Assignment problem.
22. Explain Konisberg bridge problem .
23. Draw the four tournaments on 4 vertices.
24. Define orientation of a graph and draw all the possible orientations of K_3.How many of them are strongly connected?

(5x6=30)

PART D

IV. Answer any two questions. Each question carries 15 marks.

25. Prove that a non- empty graph G with at least two vertices is bipartite if and only if it has no odd cycles.
26. State and prove Whitney's theorem.
27. a) Explain Marriage problem.
    b) Let G be a k-regular bipartite graph with $k > 0$. Then prove that G has a perfect matching.
28. Show that a weakly connected digraph D with at least one arc is Euler if and only if od(v)= id(v) for every vertex 'v'of$D$.

(2x15=30)