B.Sc. DEGREE EXAMINATION,NOVEMBER 2019
III Year V Semester
Graph Theory

Time : 3 Hours **Max.marks :75**

Section A $(10 \times 2 = 20)$ Marks

Answer any **TEN** questions

1. Define spanning subgraph with example.
2. Define cut-vertex.
3. Define Eulerian graph.
4. Define weighted graphs.
5. Define Trees with example.
6. Write any two properties of Adjacency matrix.
7. Draw a planar graphs and non- planar graphs.
8. Define exterior face.
9. Define edge colouring.
10. The following statements are true or false.
    (a) Every planar graph is 5 colourable.
    (b) Every planar graph is 4 colourable.
11. Define Hamiltonian graphs.
12. Draw a Pseudo graph.

Section B $(5 \times 5 = 25)$ Marks

Answer any **FIVE** questions

13. Prove that in any graph G the number of points of odd degree is even.
14. Prove that every Hamiltonian graph is 2- connected.
15. Prove that every connected graph has a spanning tree.
16. Prove that $\mathbf{K_5}$ is non- planar.
17. If G is a (p ,q) – graph, then prove that x(G) $\geq \frac{\mathbf{p^2}}{\mathbf{p^2 - 2q}}$
18. If G is a (p ,q) – graph, then prove that $\sum_{\mathbf{v} \in \mathbf{V(G)}} \mathbf{d}eg\,(\mathbf{v}) = 2\mathbf{q}$

19. State and prove Euler formula for planar graphs.

Section C $(3 \times 10 = 30)$ Marks

Answer any **THREE** questions

20. A connected (p, q) – graph contains a cycle iff $\mathbf{q} \geq \mathbf{p}$.
21. Explain Konigsberg bridge problem.
22. If G be a (p, q) graph the following statements are equivalent.

    (a) G is a tree. (b) G is connected and $\mathbf{q{=}p{-}1}$ (c) G is acyclic and $\mathbf{q{=}p{-}1}$
23. A graph G is planar iff G contains no subdivision of $\mathbf{K_5}$ or $\mathbf{K_{3,3}}$.
24. Write an algorithm for vertex colouring of a graph.

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