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TB246201O

Reg. No :...............................

Name :..................................

BACHELOR'S DEGREE (C.B.C.S) EXAMINATION, MARCH 2024

2021 ADMISSIONS REGULAR

SEMESTER VI - CORE COURSE (MATHEMATICS)

MT6B11B18 - Graph Theory and Fuzzy Mathematics

Time : 3 Hours

Maximum Marks : 80

Part A

I. Answer any Ten questions. Each question carries 2 marks **(10x2=20)**

1. Let G be a k-regular graph. Let k be an odd number. Show that the number of edges in G is a multiple of k.
2. Draw $K_{3,2}$ .Find the adjacency matrix of $K_{3,2}$.
3. Prove that for any graph G there is an even number of odd vertices.
4. Determine the number of edges in a tree T with 10 vertices?
5. Which of the following are Euler graphs? a) $K_{3,3}$ b) K_6
6. If G has 17 edges, what is the maximum possible number of vertices in G?
7. Calculate the number of different spanning trees of K_5.
8. State and prove Absorption by Universal set and null set laws of fuzzy set operations
9. Evaluate the 0.2 cut and 0.7 strong cut of the fuzzy set A = {(3, 0.1), (1, 0.7), (2, 0.2), (8, 0.2)} defined on the set of real numbers.
10. Find the support and height of the fuzzy set A = {(5, 0.4), (6, 0.7), (2, 0.1), (9, 1)} defined on the universal set {1, 2, 3, ..., 10}
11. Define an increasing generator and its pseudo- inverse.
12. Give an example of an idempotent t-norm.

Part B

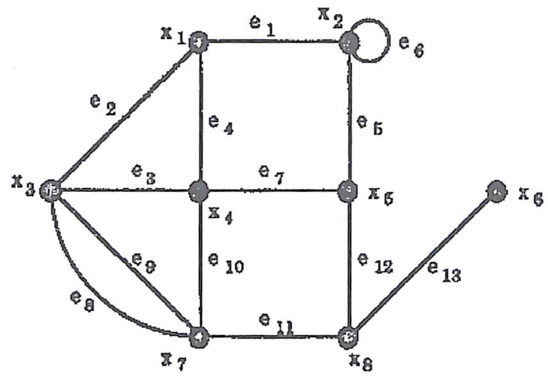
II. Answer any Six questions. Each question carries 5 marks **(6x5=30)**

13. Prove that in a Petersen graph $d(u,v) \leq 2$ for any pair of vertices u,v.
14. Show that if G is a self complementary graph with n vertices then n is either 4t or 4t+1 for some integer t.
15. Let e be an edge of a connected graph G, then prove that e is a loop if and only if it is in no spanning tree of G.
16. Let v be a vertex of a connected graph G. Then show that v is a cut vertex of G if and only if there are two vertices u and w of G, both different from v, such that v is on every u-w path in G.
17. Let e be an edge of a connected graph, show that e is a bridge if and only if it is in every spanning tree of G.
18. Prove or disprove: The standard fuzzy intersection is a strong cut-worthy property when applied to an arbitrary family of fuzzy sets.
19. Deduce the third decomposition theorem for fuzzy sets.
20. Define Yager class of fuzzy complements and show that they are involutive.
21. Define an equilibrium of a fuzzy complement and find the equilibrium of sugeno class of fuzzy complements

Part C

III. Answer any Two questions. Each question carries 15 marks **(2x15=30)**

22.



a.Find G-U, where U=$\{x_1,x_3,x_5,x_7\}$.

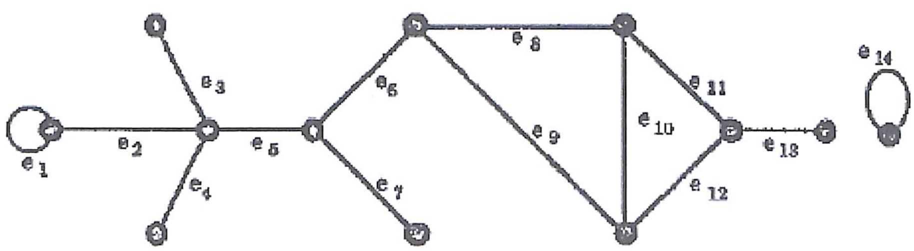
b. Find G-F where F=$\{e_2,e_4,e_6,e_8,e_{10},e_{12}\}$.

c. Find G[U] where U=$\{x_2,x_3,x_4,x_7\}$.

d.Find G[F] where F=$\{e_1,e_2,e_8,e_{11}\}$

e. Find the intersection of graphs obtained in question a. and b. .

23. a. List all the bridges in the graph



b. List all the trees with 6 vertices.

c. Draw the 16 different spanning trees of K_4. How many non isomorphic ones are there amongst them?

24. Deduce a necessary and sufficient condition for convexity of fuzzy sets defined on the set of real numbers.

25. Let a function c:[0,1]$\longrightarrow$*[0,1]* satisfy axioms c_2 and c_4. Then prove that, c is a bijective function that satisfies axioms c_1 and c_3 .