Final Assessment Test – November/December 2023

VIT® Vellore Institute of Technology

Course: BMAT205L - Discrete Mathematics and Graph Theory

Class NBR(s): 2120 / 2121 / 2122 / 2123 / 2124 / 2125 / 2127 / 2128 / 2129 / 2130 / 2131 / 2132 / 2133 / 2134 / 2136 / 2137 / 2138 / 2149 / 3918 / 3921 / 3925 / 3928 / 3932 / 3939 / 3942 / 3950 / 4409

Slot: A1+TA1+TAA1

Time: Three Hours

Max. Marks: 100

KEEPING MOBILE PHONE/SMART WATCH, EVEN IN 'OFF' POSITION IS TREATED AS EXAM MALPRACTICE

Answer any TEN Questions

(10 X 10 = 100 Marks)

1. Obtain the PCNF of the statement $S:(P\wedge Q)\vee(\neg P\wedge R)$. Using this obtain the PCNF of $\neg S$ and hence the PDNF of S. Also determine the unique representation of the PCNF and PDNF.

2. Verify the validity of the following arguments.

   Every living thing is a plant or animal.

   John's gold fish alive and is not a plant.

   All animals have hearts.

   Therefore John's gold fish has a heart.

3. State and prove the Lagrange's theorem for groups.

4. Find the code generated by the given parity matrix 'H' when the encoding function is $e: B^2 \to B^5$ and $H = \begin{bmatrix} 1 & 0 & 1 & 0 & 0 \\ 1 & 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 & 1 \end{bmatrix}$.

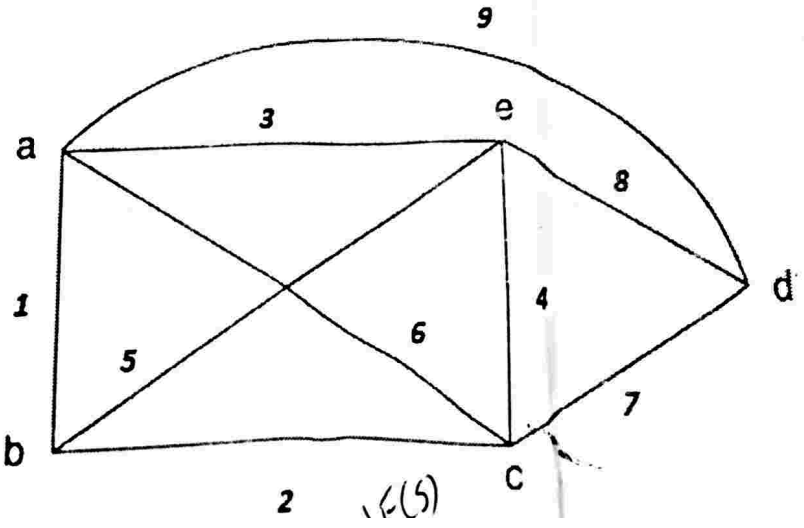
5. Use generating function to solve the recurrence relation

   $a_{n+1} - 8a_n + 16a_{n-1} = 4^n; \quad n \geq 1;\ a_0 = 1, a_1 = 8.$

6. Let S be any set, and P(S) its power set. Verify if (P(S), ≤), is a partially ordered relation, where ≤ denotes the relation 'is a subset of'. Draw the Hasse diagram of (P(S), ≤), when X = {1, 2, 3, 4}.

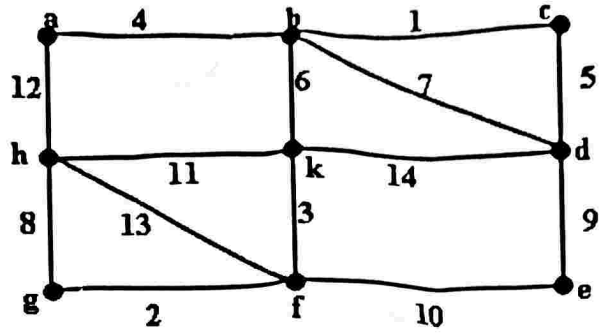
7. Show that every chain is a distributive lattice. Also discuss about the converse of this statement with justification.

8. Write the adjacency, incidence and circuit matrix for the graph G.

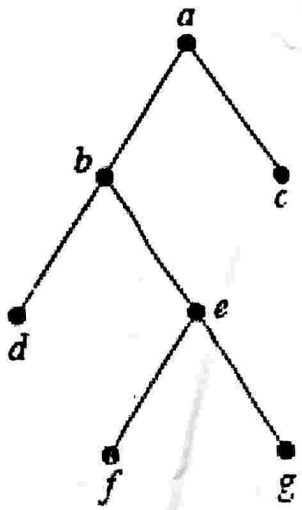


9. Prove that a connected graph G is Euler if and only if all vertices of G are of even degree.

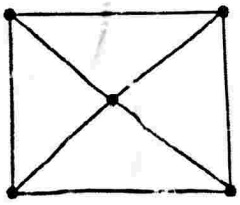
10. Determine a minimal spanning tree for the following graph using Prim's and Kruskal's algorithm.

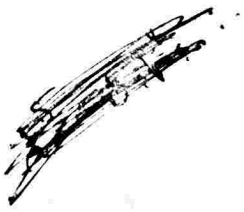


11. Prove that every tree has either one or two centres. Also, find the inorder, pre order and post order traversals for the following tree.



12. Find the chromatic number and chromatic polynomial of the following graph *G*.





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