Final Assessment Test – April 2023

VIT® Vellore Institute of Technology

Course: **BMAT205L - Discrete Mathematics and Graph Theory**

Class NBR(s): **0698 / 0718 / 0730 / 0733 / 0743 / 0748 / 0749 / 0763 / 0769 / 0777 / 0783 / 0792 / 0795 / 0850 / 2171 / 2172 / 2546 / 2547/ 4012**

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. Show that the following set of premises is inconsistent:
   "If Rama gets his degree, he will go for a job."
   "If he goes for a job, he will get married soon."
   "If he goes for higher study, he will not get married."
   "Rama gets his degree and goes for higher study."

2. Show that $(x)(P(x) \vee Q(x)) \Rightarrow (x)P(x) \vee (\exists x)Q(x)$ by the indirect method.

3. Verify whether $G = \{(a, b): a, b \text{ are rationals}, a \neq 0\}$ is a group or not under the binary operation * on G defined as $(a, b) * (c, d) = (ac, ad + b)$. Is it an abelian group?

4. State and prove Lagrange's theorem in groups and verify whether the converse is true or not. Justify the answer in detail.

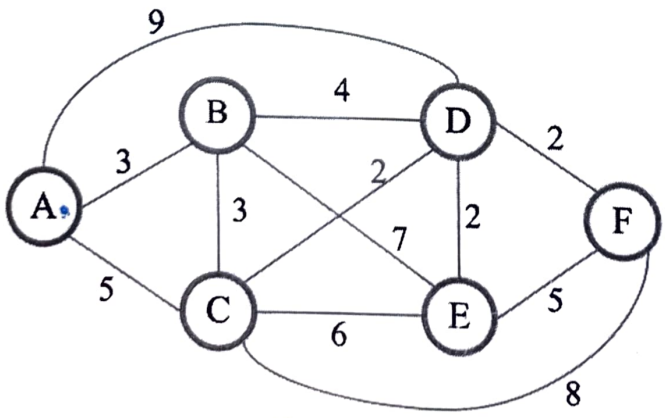
5. ABC is an equilateral triangle whose sides are of 1 cm each. If we select 10 points inside the triangle ABC, then prove that at least two of these points are such that whose distance between them is less than 1/3 cm.

6. State and prove distributive inequality in a Lattice.

7. Expand the given Boolean expression $x_1 * x_2$ in an equivalent sum of products canonical form and product of sums canonical form in terms of three variables namely x_1, x_2 and x_3.

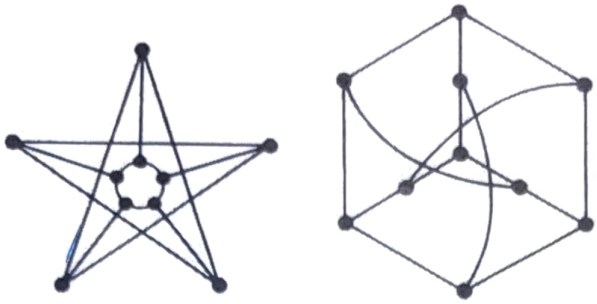
8. Verify whether the complete graph with 5 vertices is planar or non-planar.

9. (i) Apply the Dijkstra's algorithm to find the shortest path between the vertices A and F in the following weighted connected graph G and hence compute the total weight of the obtained shortest path between the mentioned vertices.



G

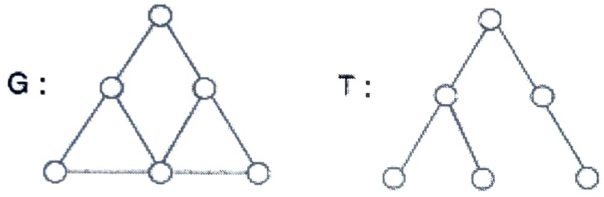
(ii) Explain isomorphism of graphs and verify whether the following two graphs G and G' are isomorphic. If so, exhibit an isomorphism between them.



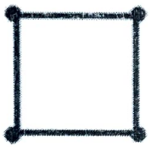
G G'

10. Prove that every tree has either one or two centers.

11. Find all the possible fundamental circuits for the given graph G with respect to the given spanning tree T. Also find at least seven possible spanning trees for the given graph G



12. Find the chromatic polynomial and chromatic number for the following graph G.



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