

QP CODE 2043510202

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DMI-ST. EUGENE UNIVERSITY

ZAMBIA

DEGREE EXAMINATION – DECEMBER 2024

Semester: IV 351GC02 DISCRETE MATHEMATICS

Time: 3:00 Hours

Max. Marks: 100

Answer any FIVE Questions (5 x 20 = 100 Marks)

1. a) In a group of 400 people, 250 can speak Hindi and 200 can speak English. How many people can speak both Hindi and English? (10 Marks)
b) Verify De-Morgan theorem of sets using Venn-diagram. (10 Marks)
2. a) Let $f' : \mathbf{N} \rightarrow \mathbf{R}$ be a function defined as $f'(x) = 4x^2 + 12x + 15$. Show that $f : \mathbf{N} \rightarrow S$, where, S is the range of f , is invertible. Find the inverse of f . (10 Marks)
b) Solve $\log_{5-x}(x^2 - 6x + 65) = 2$. (10 Marks)
3. a) Prove $(A \vee B) \wedge [(\neg A) \wedge (\neg B)]$ is a contradiction. (10 Marks)
b) Check whether the statement $p \rightarrow (q \rightarrow p)$ is a tautology or a contradiction without using the truth table. (10 Marks)
4. a) Prove that the necessary and sufficient Condition for a non empty Subset H of a group $\{G, *\}$ to be a subgroup is $a, b \in H \Rightarrow a * b^{-1} \in H$. (10 Marks)
b) State and prove Lagrange's theorem. (10 Marks)
5. a) Describe the following definitions. (5 Marks)
(i) Complete graph
(ii) Regular graph.
b) Prove that the number of vertices of odd degree in an undirected graph is even. (5 Marks)

c) Explain the following types of Subgraphs **(10 Marks)**

(i) Proper subgraph

(ii) Spanning Subgraph

(iii) Vertex deleted subgraph

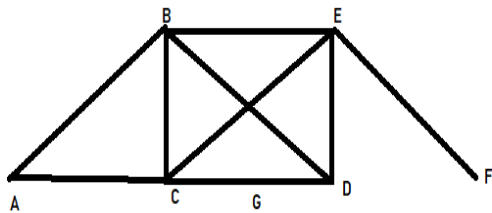
(iv) Edge deleted subgraph

(v) Induced subgraph.

6. a) With help of venn diagrams explain real numbers and its subsets. **(10 Marks)**

b) In a survey of 400 students in a school, 100 were listed as taking apple juice 150 as taking orange juice and 75 were listed as taking both apple as well as orange juice. Find how many Students were taking neither apple juice not orange juice. **(10 Marks)**

7. a) Find the number of vertices, the number of edges and the degree of each Vertex in the following undirected graphs. Verify also the hand shaking theorem in each case. **(5 Marks)**



b) Prove that A tree with n vertices has (n-1) edges. **(10 Marks)**

c) Describe the following definitions. **(5 Marks)**

(i) Tree

(ii) Spanning Thee

(iii) Minimum Spanning tree.