

School of Computing Science and Engineering

**Bachelor of Technology in Computer Science and Engineering
Semester End Examination - Jun 2024**

**Duration : 180 Minutes
Max Marks : 100**

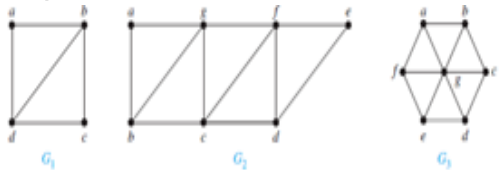
Sem II - C1UC224T- BBS01T1009 - E1UJ204T - B070201T - Discrete Mathematics

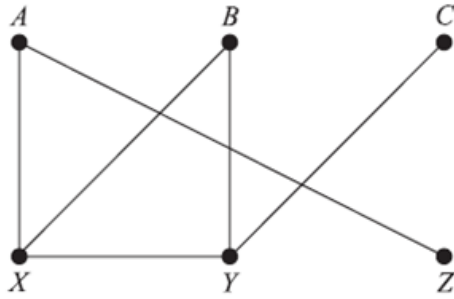
General Instructions

Answer to the specific question asked

Draw neat, labelled diagrams wherever necessary

Approved data hand books are allowed subject to verification by the Invigilator

- 1) A restaurant has 6 different desserts. Find the number of ways a customer can choose: (a) 1 dessert; (b) 2 different desserts. K1(3)
- 2) Let p and q be the propositions K2(4)
 p: I bought a lottery ticket this week.
 q: I won the million dollar jackpot on Friday.
 Express each of these propositions as an English sentence: $\neg p$, $p \wedge q$, $p \rightarrow q$.
- 3) Which graphs shown in the following figure have an Euler path? Explain it. K2(6)

- 4) Show that the inclusion relation \subseteq is a partial ordering on the power set of set S. K3(6)
- 5) Find the greatest lower bound and the least upper bound of the set $\{3, 9, 12\}$ and $\{1, 2, 4, 5, 10\}$, if they exist, in the poset $(\mathbb{Z}^+, |)$. K3(6)
- 6) Consider the set Q of rational numbers, and let * be the operation on Q defined by $a*b = a + b - ab$ K3(9)
 (a) Find $3*4$, $2*(-5)$ and $7*1/2$.
 (b) Is $(Q, *)$ a semigroup? Is it commutative?
 (c) Find the identity element for *.
- 7) Show that $\mathbb{Z}_5 = \{0, 1, 2, 3, 4\}$ forms a ring under addition and multiplication modulo 5. K3(9)
- 8) Construct a truth table for the compound proposition: $(p \rightarrow \neg q) \wedge (\neg p \rightarrow r)$ K4(8)
- 9) Consider the graph G in Figure below. K4(12)



Find:

1. All simple paths from A to C ;
2. $G - Y$;
3. All cycles;
4. All cut points;
5. Subgraph H generated by $V' = \{B, C, X, Y\}$; all bridges.

10) Let $S = \{1, 2, 3, 4\}$. With respect to the lexicographic order based on the usual "less than" relation, find all pairs in $S \times S$ less than $(3, 4)$. Draw the Hasse diagram of the poset $(S \times S, \leq)$. K5(10)

11) A) Draw the Venn diagram for the union, intersection, and symmetric difference of two sets. b) Verify De Morgan's law (any one) using Venn diagrams. K5(15)

OR

B) Show that the premises K5(15)

- a. "It is not sunny this afternoon and it is colder than yesterday,"
- b. "We will go swimming only if it is sunny,"
- c. "If we do not go swimming, then we will take a canoe trip,"
- d. "If we take a canoe trip, then we will be home by sunset"

lead to the conclusion "We will be home by sunset."

C) What rule of inference is used in each of these arguments?

1. If it snows today, the university will close. The university is not closed today. Therefore, it did not snow today.
2. It is either hotter than 100 degrees today or the pollution is dangerous. It is less than 100 degrees outside today. Therefore, the pollution is dangerous.

12) Show that $R = \{0, 2, 4, 6, 8\}$ is an integral Domain under addition and multiplication modulo 10. K6(12)

OR

Show that set of cubic roots of unity is a Group under multiplication. K6(12)