

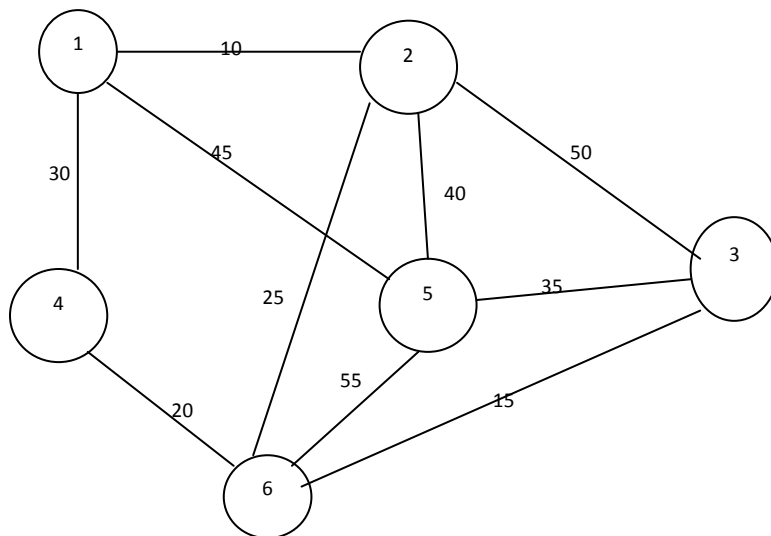
MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE
(Common to CS & CSE)

Time: 3 Hours

Max Marks: 60

Answer any FIVE questions. All questions carry EQUAL marks.

1. a. What is a Well Formed Formula? What are rules of the Well Formed Formulas? Explain
b. Show that $\sim(P \leftrightarrow Q) \Leftrightarrow (P \wedge \sim Q) \vee (\sim P \wedge Q)$.
2. a. What is predicate calculus? What is its significance? Give example for 3-place, 4-place & 5-place Predicates.
b. Prove validity of following argument using propositional logic:
 $A \rightarrow (B \rightarrow C), B \rightarrow (C \rightarrow D) \Rightarrow A \rightarrow (B \rightarrow D)$
3. a. What is pigeon hole principle? What are its applications?
b. Find the inverse of the functions: i) $f(x) = (x+1)/x$ ii) $f(x) = 4e^{(3x+1)}$
4. a. Show that intersection of two submonoids of a monoid is a monoid.
b. Explain endomorphism & Automorphism with suitable examples.
5. a. State & Prove principle of inclusion & exclusion of three variables.
b. How many 10 digit numbers are there which contain only the digit 1,2 & 3 with the digit 2 appearing in each number twice.
6. a. What is the recurrence relation for towers of Hanoi problem? Obtain a solution for it.
b. Show that $(1-4x)^{-1/2}$ generates the sequence $c(2n,n), n \in \mathbb{N}$
7. Write and explain the Kruskal's algorithm, applying the algorithm construct a minimal spanning tree for graph given bellow.



8. a. Write a short note on Euler graphs.
b. List out the rules to find chromatic number of a given graph.