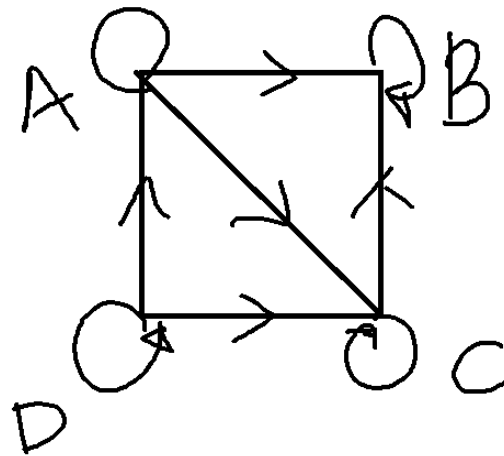


Duration: 3hrs

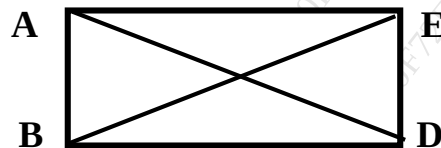
[Max Marks:80]

- N.B. : (1) Question No 1 is Compulsory.
 (2) Attempt any three questions out of the remaining five.
 (3) All questions carry equal marks.
 (4) Assume suitable data, if required and state it clearly.

- 1 Attempt any FOUR [20]
 - a Define equivalence relation and partial order set with one suitable example
 - b Write the condition for semigroup, monoid and group.
 - c Define Universal and Existential Quantifiers. Give an example for each
 - d How many vertices are needed to construct a graph having n edges and each vertex having a degree 2. Draw 2 such graphs
 - e Using laws of logic prove that $(\sim p \wedge (p \vee q)) \rightarrow q$ is a tautology
- 2 a Apply Warshall's algorithm on the following graph and explain the need of Warshall algorithm. [10]



- b Define Abelian group. Check set $A = \{0, 1, 2, 3, 4, 5\}$ is an abelian group or not under addition modulo 6. [10]
- 3 a Define Euler path and Circuit as well as Hamiltonian Path and Circuit. [10]
 Find for the following graph if any Euler path and Circuit or Hamiltonian path and circuit is existing or not? If it exists give the path and circuit if not, then justify why it is not existing.



- b How many four digit numbers can be formed from the digits 1,2,3,4,5,6,7 if none of the digits are repeated? How many of them would be greater than 4000? [10]
- 4 a Prove that sum of the n can be found as follow [10]
 $1+3+5+\dots+(2n-1)=n^2$ for $n=1,2,\dots$
- b Determine if following graphs G and G' are isomorphic or not. Determine if following graphs G and G' are isomorphic or not. [10]



- 5 a Determine the matrix of the partial order of divisibility on the set A. Draw the Hasse diagram of the poset. Indicate those which are chains. [10]
 i. $A=\{1,2,3,5,6,10,15,30\}$
 ii. $A=\{3,6,12,36,72\}$
- b Let f,g,h be functions on real numbers R defined as follows: [10]
 $f(x) = 2x+5$, $g(x) = 5x + 3$, $h(x) = 3x$
 Find: i. fog ii. gof iii. goh iv. fogoh v. gofoh
- 6 a Consider the (3,5) group encoding function defined by [10]
 $e(000)=00000$
 $e(010)=01001$
 $e(100)=10011$
 $e(110)=11010$
 $e(001)=00110$
 $e(011)=01111$
 $e(101)=10101$
 $e(111)=11000$
 Decode the following words relative to maximum likelihood decoding functions.
 i)11001 ii)01010 iii)00111

- b In a recent chit chat of a group of 30 ladies. Few ladies commented as their husbands liked Eggplants as Mashed, fried, or baked. 15 liked them mashed, 20 liked fried, and 9 liked baked eggplants. Additionally, 12 husbands liked both mashed and fried eggplants, 5 liked fried and baked eggplants. 6 liked mashed and baked, and 3 liked all three styles. How many husband hate egg plants? Explain why your answer is correct. [10]
