ADMISSION NUMBER

School of Computing Science and Engineering

Bachelor of Technology in Computer Science and Engineering
Summer Term Examination – July - August 2024

Duration : 180 Minutes
Max Marks : 100

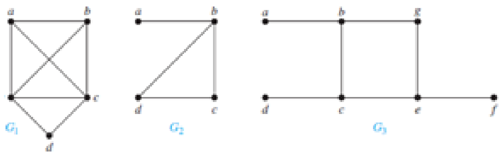
Sem II - C1UC224T - Discrete Mathematics

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 farmer buys 3 cows, 2 pigs, and 4 hens from a man who has 6 cows, 5 pigs, and 8 hens. Find the number of choices that the farmer has. K1(3)

2) Determine whether (P(S), ⊆) is a lattice where S is a set. K2(4)

3) Which of the simple graphs in the following Figure have a Hamilton circuit or, if not, a Hamilton path? K2(6)



4) What is the minimum number of students, each of whom comes from one of the 28 states, who must be enrolled in a class to guarantee that there are at least 5 who come from the same state? K3(6)

5) Show that the “greater than or equal” relation (≥) is a partial ordering on the set of integers. K3(6)

6) a) Prove that the Greatest Integer Function $f : \mathbb{R} \rightarrow \mathbb{R}$, given by f(x) = [x], is neither one-one nor onto, where [x] denotes the greatest integer less than or equal to x. K3(9)

b) Find g∘f and f∘g, if $f : \mathbb{R} \rightarrow \mathbb{R}$ and $g : \mathbb{R} \rightarrow \mathbb{R}$ are given by f(x) = cos x and g(x) = 3x2. Show that g∘f ≠ f∘g.

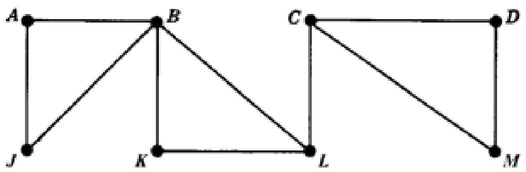
7) Consider the Group G = {1,2,3,4,5,6} under multiplication modulo 7. K3(9)

a) Draw the multiplication table of G.
b) Find $2^{-1}, 3^{-1}, 6^{-1}$.

8) Find the adjacency matrix A = $[a_{ij}]$ of each graph G in figure given below: K4(8)

(a) (b)

9) Consider the graph G in Figure below. K4(12)



Find:

1. degree of each vertex;
2. all simple paths from A to L;
3. all trails (distinct edges) from B to C;
4. d(A,C), distance from A to C; diam(G), the diameter of G.

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×S less than (2,3). Draw the Hasse diagram of the poset (S×S,≼). K5(10)

11) Answer these questions for the poset ({3,5,9,15,24,45},|): K5(15)

a) Find the maximal elements.
b) Find the minimal elements.
c) Is there a greatest element?
d) Is there a least element?
e) Find all the upper bounds of {3,5}.
f) Find the least upper bound of {3,5}, if it exists.
g) Find all the lower bounds of {15,45}.
h) Find the greatest lower bound of {15,45}, if it exists.

OR

Answer these questions for the poset ({{1}, {2}, {4}, {1, 2}, {1, 4}, {2, 4}, {3, 4}, {1, 3, 4}, {2, 3, 4}}, ⊆). K5(15)

a) Find the maximal elements.
b) Find the minimal elements.
c) Is there a greatest element?
d) Is there a least element?
e) Find all the upper bounds of {{2},{4}}.
f) Find the least upper bound of {{2},{4}}, if it exists.
g) Find all the lower bounds of {{1,3,4},{2,3,4}}.
h) Find the greatest lower bound of {{1,3,4},{2,3,4}}, if it exists.

12) a) Let Ai = {1, 2, 3, …, i} for i = 1,2,3,…. Find K6(12)

(i) $\bigcup_{i=1}^{10} A_i$ (ii) $\bigcap_{i=1}^{10} A_i$

b) Let f be the function from the set of integers to the set of integers defined by

$$f(x) = 2x + 3$$

Show that f is a bijective function. Also, find f^{-1}

OR

a) Find the minimum number of elements that one needs to take from the set S = {1, 2, 3, . . . , 9} to be sure that at least two of the numbers add up to 10. K6(12)

b) Use mathematical induction to prove that 2n < n! for every positive integer n with n≥4.