GALGOTIAS UNIVERSITY

ADMISSION NUMBER												

School of Basic Sciences

Bachelor of Science Honours in Mathematics
Semester End Examination - May 2024

Duration : 180 Minutes
Max Marks : 100

Sem VI - C1UC603T - Discrete Mathematics and Graph Theory

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) Decide whether the graphs $G_1 = (V_1, E_1)$ and $G_2 = (V_2, E_2)$ equal or isomorphic. K1 (3)
$V_1 = \{a, b, c, d\}, E_1 = \{\{a, b\}, \{a, c\}, \{a, d\}, \{c, d\}\}$
$V_2 = \{a, b, c, d\}, E_2 = \{\{a, b\}, \{a, c\}, \{b, c\}, \{c, d\}\}$

2) Show that the value of the prefix expression + - * 3 2 / 8 4 1 is 5. K2 (4)

3) Explain whether the two compound propositions are logically equivalent: K2 (6)
a) $\neg(p \leftrightarrow q)$ and $p \leftrightarrow \neg q$
b). $\neg p \leftrightarrow q$ and $p \leftrightarrow \neg q$

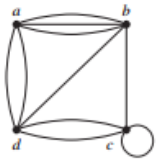
4) Apply graph theory to draw a graph with the adjacency matrix K3 (6)

$$\begin{bmatrix} 0 & 1 & 1 & 0 \\ 1 & 0 & 0 & 1 \\ 1 & 0 & 0 & 1 \\ 0 & 1 & 1 & 0 \end{bmatrix}$$

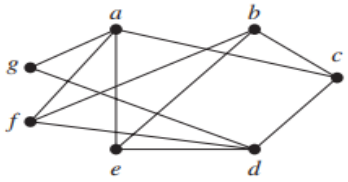
5) Write the applications of trees in discrete mathematics. K3 (6)

6) Let R={(1,2),(1,3),(2,3),(2,4),(3,1)} and S ={(2,1),(3,1),(3,2),(4,2)} be relations defined on{1,2,3,4}. Solve for SoR and RoS. K3 (9)

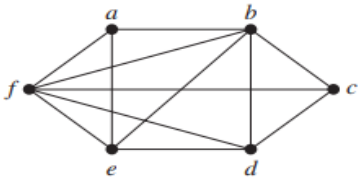
7) Develop an adjacency matrix to represent the pseudograph shown in figure. K3 (9)



8) Examine whether the graphs *G* and *H* displayed in figure bipartite? K4 (8)

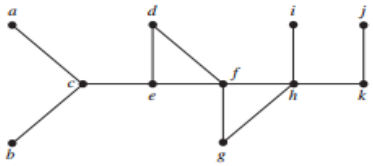


G



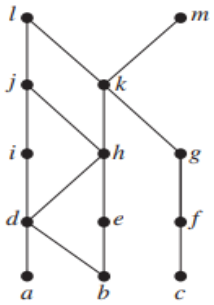
H

9) Construct a spanning tree for the given graph shown in figure using depth-first search method. K4 (12)



10) Evaluate these questions for the partial order represented by this Hasse diagram. K5 (10)

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 upper bounds of {*a, b, c*}.
f) Find the least upper bound of {*a, b, c*}, if it exists.
g) Find all lower bounds of {*f, g, h*}.
h) Find the greatest lower bound of {*f, g, h*}, if it exists



11) Consider the Z of integers and an integer m > 1. We say that x is congruent to y modulo m, written x ≡ y (mod m) if x - y is divisible by m. Prove that this defines an equivalence relation on Z. K5 (15)

OR

Prove K5 (15)

$$^{n}C_{r} + ^{n}C_{r-1} = ^{n+1}C_{r}$$

12) Discuss the applications of Graph Colorings. K6 (12)

OR

Design these graphs. K6 (12)
a) *K7* b) $K_{1,8}$
c) $K_{4,4}$ d) *C7*
e) *W7* f) *Q4*