Aliah University

End-Semester (autumn) Examination - 2021

(2nd Year 3rd Semester BTech, CSE[Regular & Supplementary])

Paper Name: Discrete Mathematics **Full Marks: 80**

Paper Code: MATUGBS04 (Regular + Supplementary) / MA 237 (Supplementary) **Time: 3 Hrs**

Group – A **(10X1=10)**

1. Fill in the blanks with appropriate answer –

a) All _____ graphs are regular.

b) Every _____ is a Lattice.

c) A relation which is not reflexive is called as Irreflexive relation. (True/False)_____

d) Degree of any vertex in a cyclic graph is _____.

e) Consider a simple graph G with k components. If each component has n_1, n_2,….n_k vertices, then maximum number of edges in G is _____.

f) A graph with Chromatic number 2 is a _____ for sure.

g) Every regular graph is Euler graph. (True/Flase)_____.

h) Let ∅ be an empty set and P (∅) be a power set of ∅ then the cardinality of P (P (P (∅))) is _____.

i) If a simple graph G with n vertices is isomorphic to its complement G', then value of n or (n-1) must be multiple of _____.

j) Consider the binary relations R and S on non-empty set A. Both R and S are reflexive. Then RUS is also reflexive. (True/False)_____

Group – B

(Answer any 6 questions) **(6X5=30)**

2. Find number of spanning trees in $K_{3,4}$. Find the vertex cover and edge cover for the same graph. Is it a planar graph?

3. Find the sum of degrees of all the vertices in any wheel graph of order 'n' (W_n)?

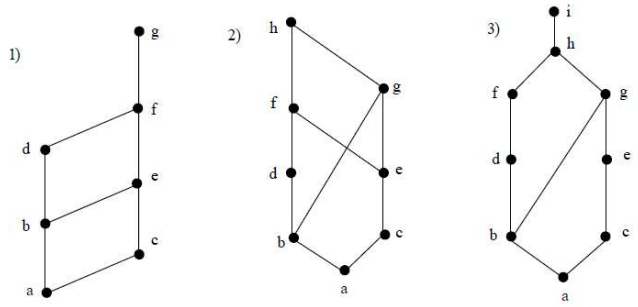
4. How many "Hamiltonian-cycles" possible for complete graph of order 5?

5. How many one-to-one and onto functions are possible for functions from set A to set B, where |A|=m and |B|=n?

6. For a relation defined as R:A→A, where |A|=11. How many reflexive, not reflexive, symmetric and anti-symmetric relations possible?

7. Insert values given below (in the order) and form the binary search tree(BST) –
Values are (in order): 12, 21, 17, 7, 20, 3, 35, 32, 9 and 78.
Delete 21 then mention the height of new BST.

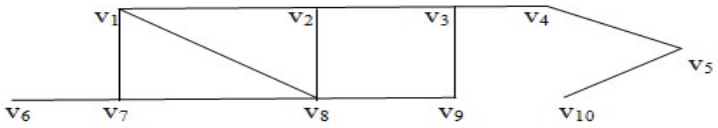
8. Which of these Hasse diagrams is/are not Lattice?



Group – C
(Answer any 4 questions) (10X4=40)

9.

a) Prove – "There are at-least 2 non-cut vertices in every non-trivial connected graph".
b) Prove – "No edge of a cycle is bridge".
c) Find out cut-vertices and bridges in the graph given below - 3+3+4=10



10. When a graph will be called as a "planar" graph? Generate the below mentioned equations (to decide planarity of a graph) with the conditions and give one example of each (here e – size and n – order of graph – 2+4+4=10

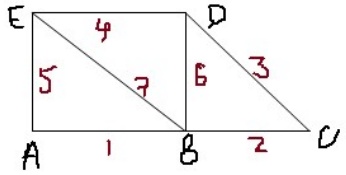
a) e <= 3n-6
b) e <= 2n-4

11.

a) Let P(x): x is perfect
F(x): x is your friend
Write the following statements in symbolic form – (use quantifiers)
I. No-one is perfect.
II. All of your friends are perfect.
III. None of your friends are perfect.

b) Mention these equations are tautology or not. (Don't use truth table)
I. $((P \rightarrow R) \wedge (Q \rightarrow R)) \rightarrow ((P \wedge Q) \rightarrow R)$
II. $((P \rightarrow Q) \wedge (P \rightarrow R)) \rightarrow (P \rightarrow (Q \wedge R))$ 1+2+2+2.5+2.5=10

12. Consider the graph given to answer the questions below - 4+3+3=10



a) Find Chromatic Polynomial and mention chromatic number (x number of colors are given for coloring).
b) Define Euler graph. Is it Euler graph? Give reason for your answer.
c) Define Hamiltonian graph. Is it Hamiltonian graph? Give reason for your answer.

13. Consider the set D_{40} = {1, 2, 4, 5, 8, 10, 20, 40} and the relation divides (/) make a Po-set = (D_{40}, /).
a) Draw the Hasse Diagram of the Po-set.
b) Find Upper Bound and Lower bound of {8, 10} and mention GLB and LUB.
c) Find join and meet for {4, 5}.
d) Is it a Lattice? If yes, then is it Complementary Lattice? 4+2+2+2=10

END