NAVRACHANA UNIVERSITY
a UGC recognized University

School:	School of Engineering and Technology
Program/s:	BSC Data Science
Year: 2nd	**Semester:** 3rd
Examination:	End Semester Examination
Examination year:	December - 2021

|			
Course Code: DS215	**Course Name:** Discrete Mathematics		
Date: 07/12/2021		**Total Marks:**	40
Time: 8:30 am to 10:30 am		**Total Pages:**	2

Instructions:

→ *Write each answer on a new page.*
→ *Use of a calculator is permitted.*
→ *Draw all relevant waveforms in answer sheet only.*
→ ** COs=Course Outcome mapping. # BTL=Bloom's Taxonomy Level mapping*

| Q. No.	Details	Marks	COs*	BTL#
Q.1	**Attempt ANY 10 from the following:**	**[10]**		
A.	What is a proposition?	1	CO1	1
B.	A compound proposition that is always true is called a _____.	1	CO1	1
C.	Let $P(x)$ be the statement "x can speak Gujarati" and let $Q(x)$ be the statement "x knows the computer language HTML." The domain for quantifiers consists of all the Data Science students at NUV. Convert the proposition $\exists x(P(x) \wedge \sim Q(x))$ into English sentence.	1	CO2	3
D.	What rule of inference is used in the following arguments? "If it is rainy, then the pool will be closed. It is rainy. Therefore, the pool is closed." Write your answer in the box given below.	1	CO2	2
E.	What is the meaning of a contrapositive statement?	1	CO1	1
F.	(True/False) A relation $R = \{(1,3),(1,4),(2,3),(2,4),(3,1),(3,4)\}$ on set $A = \{1,2,3,4\}$ is anti-symmetric.	1	CO3	4
G.	Boolean algebra is a _____ and _____ lattice. Write the appropriate type of lattice in the blanks.	1	CO3	1
H.	What is the bitwise AND of the bit strings 1011 1100 and 0101 0101 ?	1	CO4	5
I.	(True/False) A pseudograph is a directed graph having multiple edges and loops.	1	CO5	2
J.	Give example of any one non-planar graph. (Write name only, do not draw.)	1	CO5	1
K.	Draw a complete graph K_4 having 4 vertices.	1	CO5	5
L.	There are at most _____ leaves in a 3-ary tree of height 5.	1	CO6	1
Q. 2	**Attempt ANY 5 from the following:**	**[10]**		
A.	Write the precedence of all the logical operators.	2	CO1	1
B.	Show that $\sim(p \Rightarrow q)$ and $p \wedge \sim q$ are logically equivalent using logical identities.	2	CO2	4
C.	Calculate the number of relations on a set with 4 elements.	2	CO3	4
D.	Draw the Hass diagram of the poset of set of divisors of 12, with "divides" relation.	2	CO3	3
E.	Derive complement of 2 in a lattice $L = \{1, 2, 3, 6\}$ with relation "Divides".	2	CO3	5

F.	Define the Euler circuit and the Hamilton circuit.	2	CO6	5
G.	Determine how many edges are there in a graph with 8 vertices each of degree five?	2	CO5	4

Q. 3   **Attempt <u>ANY 5</u> from the following:**   **[20]**

A.	Explain any two logical operators (logical connectives) with one example each.	4	CO2	1
B.	Prepare a truth table of $(p \Rightarrow q) \wedge (q \Rightarrow r) \Rightarrow (p \Rightarrow r)$ and determine whether it is tautology, contradiction or contingency.	4	CO2	6
C.	Consider a poset $(\{3, 5, 9, 15, 24, 45\}, |)$ with "divides" relation.	4	CO3	4

     (i).   Find the maximal elements.
     (ii).   Find the minimal elements.
     (iii).   Find all upper bounds of $\{3, 5\}$.
     (iv).   Find the least upper bound of $\{3, 5\}$, if it exists.
     (v).   Find the greatest lower bound of $\{15, 45\}$, if it exists.

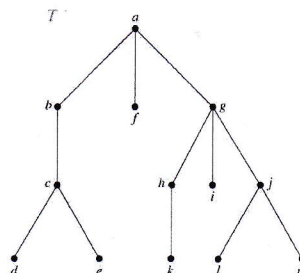|				
D.	Construct a circuit from inverters, AND gates, and OR gates to produce output $\overline{(\bar{x} + z)(y + \bar{z})}$.	4	CO4	6
E.	Find (i) the number of vertices, (ii) the number of edges, (iii) degree of each vertex, (iv) neighborhood of each vertex in the given graph. Also (v) Identify all isolated and (vi) pendant vertices.	4	CO5	4
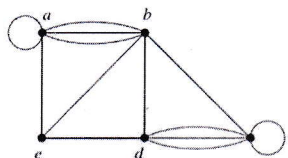
F.	Define (i) Dual of a map (ii) Graph Coloring (iii) Chromatic number Draw dual of the map and determine its chromatic number:	4	CO6	6

G.		4	CO6	4
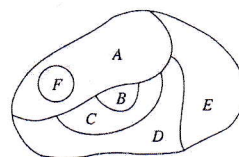
The rooted tree T with root a is shown in the figure. Find

     (i).   The siblings of l,
     (ii).   All ancestors of d,
     (iii).   All descendants of g,
     (iv).   All internal vertices,
     (v).   All leaves.

************End of Question Paper************