## **End-Term Examination**

## (CBCS)(SUBJECTIVE TYPE)(OffLine)

Course Name: B.Tech , Semester: 3rd Sem.

(December, 2024)

Subject Code: BCS 203	Subject: Discrete Structures
Time :3 Hours	Maximum Marks: 60

Note: Q1 is compulsory. Attempt one question each from the Units I, II, III & IV.

Q1	(5*4-20)
a) Identify the nature of the proposition S, whether it is Tautology/	(5*4=20)
Contingency/ Contradiction.	
$S: ((P \land Q) \rightarrow R) \rightarrow ((P \land Q) \rightarrow (Q \rightarrow R))$	
b) Draw the Hasse Diagram of the following: $D_{105}$ , and $D_{72}$	
c) Prove that group G is an Abelian group if and only if $(ab)^{-1} = a^{-1}b^{-1}$	-1,
$\forall a,b \in G.$	
d) The chromatic number of the following graph is	
Fig. (a)	b
W.	State 1
UNIT I	4.5
Q2 a) Let p, q, r, s represent the following propositions.	(5+5)
p: x∈{8,9,10,11,12}	
q: x is a composite number	300
r: x is a perfect square	
s: x is a prime number  The integer $x \ge 2$ which satisfies: $\neg((p \Rightarrow q) \land (\neg r \lor \neg s))$ is	
<ul> <li>b) The binary operator ≠ is defined by the following truth table.</li> </ul>	
b) The binary operator $\varphi$ is defined by the following truth tasks.	
$p \mid q \mid p \neq q$	
0 0 0	
0 1 1	
1 0 1	
Identify the state of the binary and the whother it is associative	
Identify the nature of the binary operator ≠, whether it is associative,	1
commutative, or both?	days are (5+5
a) Translate the following into propositional logic: i) not all rainy	40752.0
cold ii) None of my friends are perfect. Note: Where the varia	וטובא מוב.
rainy(x), cold(x), f(x): friend, p(x): perfect.	

A. $((a \rightarrow b) \land (b \rightarrow c)) \rightarrow (a \rightarrow c)$ B. $(a \leftrightarrow c) \rightarrow (\sim b \rightarrow (a \land c))$ C. $(a \land b \land c) \rightarrow (c \lor a)$ D. $a \rightarrow (b \rightarrow a)$ UNIT II  Q4 a) Using the principle of mathematical induction, Show that $2^{2n}$ . 1 is divisible by 3. b) Find the total number of relation on a set R with n elements which is antisymmetric but not reflexive. a) Prove that the relation congruence modulo m on the set Z of all integers is an equivalence relation. b) Explain the following Sets with example: a) Finite b) Infinite, c) Countable d) Uncountable.  UNIT III  Q6 a) Define a Field. Prove that the set of integers $Z_{11}$ with addition and multiplication is a Field. b) State and prove Lagrange's theorem for finite groups.  Q7 a) Prove that a group of prime order p is cyclic. b) Let $C$ be the set of all positive rational numbers and * be the binary operation on $C$ defined as $C$ a * b = $C$ prove that $C$ be an abelian group.  UNIT IV  Q8 a) State and prove Euler's formula for connected planar graphs: V-E+R= 2, where V, E, and F represent vertices, edges, and region, respectively. where V, E, and F represent vertices, edges, and region, respectively. The number of distinct minimum-weight spanning trees in the following graph is  Q9 3 3 3 4 5 4 5 4 5 5 5 5 5 5 5 5 5 5 5 5		b) Identify the first transfer of the first	
B. (a ↔ c) → (~ b → (a ∧ c)) C. (a ∧ b ∧ c) → (c ∨ a) D. a → (b → a)  UNIT II  Q4 a) Using the principle of mathematical induction, Show that 2 <sup>2n</sup> - 1 is divisible by 3. b) Find the total number of relation on a set R with n elements which is antisymmetric but not reflexive.  Q5 a) Prove that the relation congruence modulo m on the set Z of all integers is an equivalence relation. b) Explain the following Sets with example: a) Finite b) Infinite, c) Countable d) Uncountable.  UNIT III  Q6 a) Define a Field. Prove that the set of integers Z <sub>11</sub> with addition and multiplication is a Field. b) State and prove Lagrange's theorem for finite groups.  Q7 a) Prove that a group of prime order p is cyclic. b) Let G be the set of all positive rational numbers and * be the binary operation on G defined as a * b = <sup>2n</sup> / <sub>2</sub> , ∀a, b ∈ G. Prove that (G,*) be an abelian group.  Q8 a) State and prove Euler's formula for connected planar graphs: V-E+R= 2, where V, E, and F represent vertices, edges, and region, respectively, where V, E, and F represent vertices, edges, and region, respectively, where V, E, and F represent vertices, edges, and region, respectively, where V, E, and F represent vertices, edges, and region, respectively, where V, E, and F represent vertices, edges, and region, respectively, where V, E, and F represent vertices, edges, and region, respectively. b) The number of distinct minimum-weight spanning trees in the following graph is  Q8 (V,E) is an undirected simple graph in which each edge has a distinct weight, and e is a particular edge of G. Which of the following statements about the minimum spanning trees (MSTs) of G is/are TRUE?  Q9 1 If e is the lightest edge of some cycle in G, then every MST of G includes e.  Q9 1 If e is the heaviest edge of some cycle in G, then every MST of G excludes e.		b) Identify the following Boolean expressions which is/are NOT tautology?	
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a * b = \frac{ab}{7}, ∀a, b ∈ G. Prove that (G,*) be an abelian group.  UNIT IV  a) State and prove Euler's formula for connected planar graphs: V-E+R= 2, where V, E, and F represent vertices, edges, and region, respectively. The number of distinct minimum-weight spanning trees in the following graph is  b) The number of distinct minimum-weight spanning trees in the following graph is  c  d  G = (V,E) is an undirected simple graph in which each edge has a distinct weight, and e is a particular edge of G. Which of the following statements about the minimum spanning trees (MSTs) of G is/are TRUE?  I. If e is the lightest edge of some cycle in G, then every MST of G includes e.  III. If e is the heaviest edge of some cycle in G, then every MST of G excludes e.		b) Let G be the set of all positive rate	
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excludes e.	ı	e.  I. If e is the heaviest edge of some cycle in G, then every MST of G.	
b) Prove that: Any planar graph can be color.	е	excludes e. he colored using at most five	
ALEGERT VOLUME TO THE TOTAL PROPERTY OF THE PR	b) P	rove that: Any planar graph can be designed the same color.	

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