Total No. of Questions: 4

Enrollment No. EN21CS303029

Faculty of Engineering

Mid Seml Examination September -2022

IT3BS06/CS3BS06 Discrete Mathematics

Programme: B.Tech. Branch/Specialisation: CSE/ IT

Duration: 2 Hrs. **Maximum Marks: 40**

Q.1 i. If a function f:A→ B is one one but not onto then **1**

a) $|A| < |B|$ b) $|A| = |B|$

c) $|A| > |B|$ d) none of these

ii. If A={1,2,3,4} and a relation defined from A to A such that R={(a,b): a=$\sqrt{b}$ } then Dom$R^{-1}$is **1**

a) {1,3,4} b) {1,4} c) {1,2} d) {3,4}

iii. Which of the following is power set of A = {a,b,Ø } **1**

a) P(A) = { Ø, {a} ,{b} }

b) P(A) = {Ø , {a}, {b} , {a,b,Ø }}

c)P(A)={Ø,{Ø}, {a}, {b}, {a, b}, {b, Ø}, {a,Ø}, {a,b,Ø} }

d)P(A)={Ø,{a},{b},{a,b},{b,Ø,} {a,Ø},{a,b,Ø}}

iv. If $f(x) = x^3 - 3x$ and $g(x) = 3x - x^3$ then $fog(x)$ is **1**

a) $(3x - x^3)^3$

b) $3x - x^3$

c) $(3x - x^3)$ -3$(3x)$

d) $(3x - x^3)^3$-9x +3x^3

v. If A= {1,2,3,4} and B= {1,2,3,4,5} then $|A \times B|$ is **1**

a) 12 b) 2^{20} c) 20 d) 20^2

vi. If R be a partial order relation in set A then which of the following is incorrect **1**

a) R is reflexive

b) R is symmetric

c) R is anti symmetric

d) R is transitive

vii. In Boolean algebra for a,b∈ B which of the following is correct **1**

a) a+a′.b= (a+b)′ b) a+a′.b = a+b

c) a+a′.b = a d) a+a′.b =0

viii. In Boolean algebra for a∈ B **1**

a) (a′)′=a′ b) (a′)′=a

c) (a′)′=a″ d) None of these

ix. A set P with partial ordered relation R is called 1
a) POSET
b) TOSET
c) Comparable set
d) None of thee

x. If (P,≤) be a partial ordered set (POSET). An element m in P is said to be maximal element if 1
a) m≥ $x \Rightarrow m = x$ (for any x∈ P)
b) m≤ $x \Rightarrow m = x$ ($for\ any\ x \in P$)
c) m / $x \forall\ x \in P$
d) None of these

Q.2 i. Show that if 45 dictionaries in a college library contain a total of 92537 pages each, then one of the dictionaries must contain at least 2057 pages 2

ii. If A and B are two sets, prove that $A \cup B = (A - B) \cup (B - A) \cup (A \cap B)$ 3

iii. In a class of 100 students, 39 play tennis ,58 play cricket, 32 play hockey ,10 play hockey and cricket, 11 play hockey and tennis ,13 play tennis and cricket, using principle of inclusion and exclusion find how many students play 5
a) All three games
b) Just play one game.

OR iv. A function f: N⟶ N defined by $f(x) = x^3$ then check f is one one or not 5

Q.3 i. Define maximal and minimal elements of POSET. 2

ii. Let I be the set of positive integers prove that the relation ≤ (less than or equal to) is partial ordered relation. 3

iii. Using Boolean algebra (B, +,.,′) prove that given statements are equivalent 5
a) $a.b' = 0$
b) $a' + b = 1$.

OR iv. Let S be a set of family of all sets which is closed under the operation union "∪ " and intersection " ∩" and complementary law then prove (S,∪,∩,') is Boolean algebra. 5

Q.4 i. State Pigeonhole Principle. 2

ii. Define Equivalence Relation. 3

iii. Using Boolean algebra (B, +,.,′) prove that (a+b).(a′ +b)= (a.b) + (a′ .b) $\forall\ a, b \in B$ 5

OR iv. If A={1,2,3} and P(A) is power set of set A and relation of inclusion (A is subset of B) is defined in P(A)then find maximal and minimal elements of P(A) 5

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