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Following Paper ID and Roll No. to be filled in your Answer Book.

PAPER ID : 21109	Roll No.										

B. C. A. Examination 2021-22

(Even Semester)

MATHEMATICS II

Time : Three Hours] *[Maximum Marks : 60*

Note :– Attempt all questions.

SECTION – A

1. Attempt all parts of the following : $8 \times 1 = 8$

   (a) Find the power set of the set $\{\{a\}\}$.

   (b) Define proper sub-set.

   (c) Define equivalance relation.

   (d) Define null-set.

   (e) Define minimal and maximal element in a poset.

   (f) Define bounded lattices.

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(g) What is cyclic group?

(h) Define semi group.

SECTION – B

2. Attempt any two parts of the following : $2 \times 6 = 12$

(a) Let $F : A \rightarrow B$, $g: B \rightarrow C$ if f and g are injective function then show that gof: $A \rightarrow C$ is also injective function.

(b) For any two set A and B prove that

$$A - (A \cap B) = A - B$$

(c) State and prove Demorgan's law.

(d) Prove that $f(x) = 3x + 5$, $\forall\ x \in R$ is a bijective function.

SECTION – C

Note:- Attempt all questions. Attempt any two parts from each questions. $8 \times 5 = 40$

3. (a) If A, B and C are non-empty sets, then prove that

$$A \times (B \cap C) = (A \times B) (A \times C)$$

(b) Show that every relation which is symmetric and transitive must be reflexive.

(c) Define a lattice.

4. (a) Prove that the intersection of two equivalence relation on a set is an equivalence relation on a set.

(b) Let A = { 1, 2, 3, 4}, B = {a, b, c, d}

C = {x, y, z} and let R = {(1, a), (2, d), (3, a), (3, b), (3, d) }, S = { (b, x), (b, z), (c, y), (d, z)} find ROS.

(c) Show that if a relation R is transitive then R^{-1} is also transitive.

5. (a) Find the greatest lower bound and the least upper bound of the set {2, 3, 6} if they exist in the boset $(D_{24}, /)$.

(b) Show that the relation "$\geq$" is a partial order on the set of integer Z.

(c) Define supremum and infirmum in lattice.

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6. (a) Prove that G = { 1-1, i, -i} is an abelian group with respect to multiplication when 'i' is cube root of unity.

(b) What are the properties which must be satisfied by a set 'G' such that it is a group?

(c) Define a ring.

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