Slot: C 1 SRM UNIVERSITY SET- A

DEPARTMENT OF MATHEMATICS

15MA302 – Discrete Mathematics

CYCLE TEST-I

Duration: 100 min **Answer all the questions** **Max. Marks: 50**

Part –A (5 X 4 marks =20 marks)

1. Form the truth table for $[(p \vee q) \wedge (p \rightarrow r) \wedge (q \rightarrow r)] \rightarrow r$.

2. Symbolize the following.: (i) All integers are either positive or negative.

(ii) Some real numbers are rational.

3.(i) If a function f: Z⟶Z is defined by f(x) = 2x+3 , prove that f is 1-1 and onto.

(ii) Let R= { (1,2), (2,2), (3,4)} be a relation on A= {1,2,3,4}. Find R^2 *and* R^3

4. *If we select 10 points in the interior of an equilateral triangle of side 1, show that there must be atleast two points whose distance apart is less than 1/3.*

5. Draw the Hasse diagram for the partial ordering R = {(A,B)/ A⊆B} on the power set *P(S)* where S= {a, b, c}

Part –B (3 X 10 marks =30 marks) Answer any three questions

6. i) Show that b can be derived from the premises a⟶b, c⟶b, d⟶(a∨c), d , by indirect method.

ii) Show that p⟶q , p⟶r , q⟶¬ r and p are inconsistent.

7. i) Using mathematical induction, prove that, $(6 \times 7^n) - (2 \times 3^n)$ is divisible by 4 for n ≥1.

ii) If f: A⟶B and and g: B⟶C are invertible functions, then show that (g_of): A⟶C is also invertible and $(gof)^{-1} = f^{-1} o\, g^{-1}$

8. Let A={1,2,3,4} and R= {(1,2), (2,3), (3,3), (3,4), (4,2) }. Find Reflexive closure and symmetric closure of R. Also find the transitive closure of R using Warshall's algorithm.

9. Prove that (i) $(x)(P(x) \rightarrow Q(x)) \wedge (x)(R(x) \rightarrow \neg Q(x)) \Rightarrow (x)(R(x) \rightarrow \neg P(x))$

(ii) $(x)(H(x) \rightarrow M(x)) \wedge (\exists x)H(x) \Rightarrow (\exists x)M(x)$

All the best