Model Question Paper for Minor Examination (ISA-1)		
Course Code:	22ECAC201	Course Title:Discrete Mathematical Structures
Duration	75 mins.	
Max. Marks	15	
Note: Answer any two full questions		

Q.No	Questions	Marks	CO	BL	PO	PI Code
1.a	P(x, y) is “x is a citizen of y.” Q(x, y) is “x lives in y.” The universe of discourse of x is the set of all people and the universe of discourse for y is the set of US states.Express each of these statements as logical expression using predicates, quantifiers and represent the negation of the same using Demorgan’s laws. i. All people who live in Florida are citizens of Florida. ii. Every state has a citizen who does not live in that state.					
b	i. Prove that if n is a positive integer and n is odd then 5n + 6 is odd using direct proof. ii. Show that if n is an integer and $n^3 + 5$ is odd, then n is even using proof by contradiction.					
c	On the set of real numbers R = {x : −∞ < x < ∞} define the relation S = {(x, y) : x, y ∈ R, and x − y is an integer}. Determine whether the relation S on the set is reflexive, symmetric, antisymmetric, and/or transitive.					
2a	Show the following are logically equivalent using laws i. (p→ (q V r)) → ((~q V s) ^ ~s) ≡ ~q ii. ~ (p V (~p ^q)) ≡ ~p ^ ~q					
b	Let f be the function from R to R such that f(x) = $\frac{4x}{5-x}$. Find f^{-1}(x) and fof^{-1} .					
c	Let Q(x, y) be the statement "Student x has been a contestant in a quiz show y." Express each of these logical expressions into English statements where the domain for x consists of all students at your school and y consists of all quiz shows on television. i. ∃x ∃y Q (x, y) ii. ~∃x ∃y Q (x, y)					

	iii. $\exists x$ (Q(x, Jeopardy)^Q(x, Wheel of Fortune)) iv. $\exists x \exists y((x \neq y) \wedge Q(x, \text{Jeopardy}) \wedge Q(y, \text{Jeopardy}))$					
3a	State the converse, contrapositive, and inverse of each of these conditional statements. i. If it snows today, I will ski tomorrow. ii. I come to class whenever there is going to be a quiz. iii. A positive integer is a prime only if it has no divisors other than 1 and itself.					
b	Let R be the relation R = {(a, b) | a divides b} on the set S= {1,2,3,4,6}. Represent the relation R as matrix and digraph. Find R^3 and check what are the closures satisfied by the relation R^3.					
c	Use rules of inference to show that the hypothesis “All clear explanations are satisfactory”, “Some excuses are unsatisfactory” imply the conclusion therefore “Some excuses are not clear explanations.” Use rules of inference to prove.					