

## Back Paper

**IIIrd SEMESTER EXAMINATION, 2023 – 24**  
**IInd yr B.Tech. – Computer Science and Engineering**  
**Discrete Structure**

Duration: 3:00 hrs

Max Marks: 100

*Note: - Attempt all questions. All Questions carry equal marks. In case of any ambiguity or missing data, the same may be assumed and state the assumption made in the answer.*

Q 1.	<p>Answer any four parts of the following.</p> <p>a) Prove that a relation R on a set is symmetric  Iff <math>R \equiv R^{-1}</math></p> <p>b) Prove that  <math>(A \times B) \cap (P \times Q) = (A \cap P) \times (B \cap Q)</math></p> <p>c) Let <math>A=B = \{1,2,3,4,5\}</math>. Define Function <math>f:A \rightarrow B</math>  i. 'f' is one to one and onto  ii. 'f' is onto but not one to one</p> <p>d) If <math>f: A \rightarrow B</math> and <math>g: B \rightarrow C</math> are two bijective, then  <math>(g \circ f)^{-1} = f^{-1} \circ g^{-1}</math></p> <p>e) Find a formula for the inverse of <math>f(x) = \frac{2x-3}{5x-7}</math></p> <p>f) If <math>f(x) = x^2</math>, <math>g(x) = x^3</math> find (i) <math>f \circ g(x)</math> and (ii) <math>g \circ f(x)</math></p>	5x4=20
Q 2.	<p>Answer any four parts of the following.</p> <p>Define:</p> <p>a) Isomorphism.  b) Hamiltonian &amp; Euler walk.  c) Deduction theorem.  d) Syntax and semantics.  e) Pseudo Boolean Lattice.  f) Hashing Function.</p>	5x4=20
Q 3.	<p>Answer any two parts of the following.</p> <p>a) Define:  i. Integral Domain  ii. Lattice &amp; Poset with an example.</p> <p>b) If <math>A = \{a,b,c\}</math>, then, power set <math>P(A)</math> under Relation 'subset' is a poset.</p> <p>c) Show that <math>P \Leftrightarrow (p \vee q) \rightarrow (p \wedge q)</math> using truth table &amp; algebra of preposition.</p>	10x2= 20
Q 4.	<p>Answer any two parts of the following.</p> <p>a) Prove that:  <math>G = \{1,2,3,5,6,7\}</math> is a finite abelian group of order '6' under multiplication modulo 7.</p>	10x2= 20

	<p>b) Among the first 1000 positive integers:</p> <p>(i) Determine the integers which are not divisible by 5, nor by 7, nor by 9.</p> <p>(ii) Determine the integers divisible by 5, not by 7, not by 9.</p> <p>c) Define pigeonhole principle. Find the minimum number of students in a class to be sure that three of them are born in the same month.</p>	
Q 5.	<p>Answer any two parts of the following.</p> <p>a) In a shipment, there are 400 floppy disks of which 50 are defective. Determine.</p> <p>i. In how many ways we can select fifty floppy disks?</p> <p>ii. In how many ways we can select fifty non-defective floppy disks?</p> <p>In how many ways we can select 50 floppy disks containing exactly '30' defective floppy disks?</p> <p>b) Find the solution of the recurrence relation by generating function method <math>a_n = 3a_{n-1} + 5n</math>, what is the solution with <math>a_1=8</math>.</p> <p>c) Show that <math>\{0,1,2,3,4,5,6,7\}(x,+)</math> is ring under modulo '8'.</p>	10x2= 20

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