**CSI-32**

# ADIT/BIT PROGRAMME

## Term-End Examination

## June, 2010

00764

# CSI-32 : DISCRETE MATHEMATICS

*Time : 3 hours* *Maximum Marks : 75*

***Note :*** *All questions from* ***Section - A*** *are* ***compulsory****. Attempt* ***any three*** *questions from* ***Section - B****.*

## SECTION-A

**1.** State **True/False** for each of the following and also give reason for your answer : **10**

(a) P(S) is power set of set S. Then $P[P(S)] = P(S)$

(b) Total number of equivalence relations of set {1, 2, 3, 4} is 15.

(c) If $\phi$ is an empty set. Then $P(\phi) = \{\phi\}$

(d) A cycle of length 2 is called a transposition.

(e) If $f(x) = x^2 + x$ and $g(x) = x + 1$ Then $fog = x^2 + x + 1$

**2.** (a) Suppose $X = \{2, 1, 4, 3\}$. Consider the fuzzy sets A and B of X given by **3**

$$A = \left\{\frac{.5}{2}, \frac{.1}{1}, \frac{1}{4}, \frac{0.8}{3}\right\} \text{ and } B = \left\{\frac{.4}{1}, \frac{.6}{2}, \frac{.7}{3}, \frac{.6}{4}\right\}$$

Find $A \cup B$, Where $\frac{x}{r}$ denotes '$r$ is the degree of membership of $x$'

(b) Show that $P \rightarrow (Q \rightarrow P)$ is a tautology. 3

(c) Find Principal Disjunctive Normal form of $(\sim p \vee \sim q) \rightarrow (\sim p \vee r)$, where '$\sim x$' denotes 'negation of $x$' 4

3. (a) Express $P \downarrow Q$ using $\uparrow$ only. 3

(b) Let R be the relation in the natural numbers N defined by $x$ is related to $y$ if and only if '$x - y$ is divisible by 8'. Prove that R is an equivalence relation. 4

(c) Let $f(x) = 2x - 1$, $g\ (x) = 5x$ Show that $fog \neq gof$. 3

## SECTION - B

*Attempt any three questions from this section.*

**4.** (a) Let A be the set of all triangles in a plane and let R be a relation on A defined as aRb if and only if "*a* is congruent to *b*" for a, b $\in$ A. Show that R is an equivalence relation. **6**

(b) For any three arbitrary Sets A, B and C, show that $(A-B)-C=A-(B\cup C)$ **5**

(c) Draw Hesse Diagram for the set **4**

$X=\{1, 2, 3, \ldots\ldots, 10\}$, w. r. t. the relation "divides"

**5.** (a) Draw Venn diagram showing **4**

$(A\cap B)=(A\cap C)$ But $B\neq C$

(b) Among 50 students in a class, 26 got grade 'A' in the first examination and 21 got grade 'A' in second examination. If 17 student did not get an 'A' in either examination, how many students got 'A' in both the examinations ? **5**

(c) Let $A=\{1, 2, 3, 4\}$ and $B=\{a, b, c, d\}$ and let function $f : A\to B$ be defined by $f=\{(1, a), (2, a), (3, d), (4, c)\}$. Show that $f$ is a function but $f^{-1}$ is not a function. **6**

6. (a) If $f : A \rightarrow B$ and $g : B \rightarrow C$ be one one, onto functions, then gof is also one to one, onto. **6**

(b) Using truth table show that **4**

$[\sim q \wedge (p \rightarrow q)] \rightarrow \sim p$ is a tautology.

(c) Prove the logical equivalence of **5**

$(p \vee q) \wedge \sim p \equiv \sim p \wedge q$

7. (a) Draw Venn Diagram for $(A \cap B) \cup C$ **5**

(b) If $A = \{1, 2, 3, 4, 5, 6, 7\}$ and **4**

$B = \{3, 4, a, b, c, d\}$ Find $A \Delta B$.

(c) If $f = \begin{pmatrix} 1 & 2 & 3 \\ 2 & 3 & 1 \end{pmatrix}$ and $g = \begin{pmatrix} 1 & 2 & 3 \\ 2 & 1 & 3 \end{pmatrix}$ **6**

Find fg and gf.