00711

ADIT/BIT PROGRAMME

Term-End Examination

December, 2011

CSI-32 : DISCRETE MATHEMATICS

Time : 3 hours *Maximum Marks : 75*

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

SECTION - A

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

(a) If $X = \{a\}$ then $P(x) = \{\{a\}\}$, where $P(x)$ denotes power set of X.

(b) Let $Y = \{a, b\}$, then the following relation R is an equivalence relation on Y :

$R = \{\{a, a\}, \{b, b\}, \{c, c\}\}$.

(c) A cycle of length 4 is called a transposition.

(d) Every permutation can be written as a product of cycles.

(e) If $f(x) = x^2$ and $g(x) = x^3$ then $(fog)\ (x) = (gof)\ (x)$.

2. (a) Suppose $X = \{a, b, c, d\}$. Consider the fuzzy sets Y and Z such that : **3**

$Y = \{0.6/a, 0.2/b, 1.0/c, 0.7/d\}$ and

$Z = \{0.4/a, 0.9/b, 0.2/c, 0.7/d\}$ then

Find $Y \cap Z$, where 'n/r' denotes 'n is the degree of membership of r'

(b) Show $P \vee (P \rightarrow \theta) \vee (\sim\theta)$ is a tautology. **3**

(c) Find Principal Conjunctive Normal form of $(\sim p \vee \sim\theta) \rightarrow (\sim p \vee r)$ where '$\sim x$' denotes 'negation of x'. **4**

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

(b) Let R be the relation on Integers defined by $6x$ is related to y under R if and only if 12 divides $x - y$, where x and y are integers', then R is an equivalence relation. **4**

(c) If $f(x) = 3x + 1$ and $g(x) = 7x$ then show that $\Delta\ (fog)(x) \neq (gof)(x)$. **3**

SECTION - B

Attempt *any three* questions from this section.

4. (a) Let A be the set of all rectangles in a plane, and R be *a* relation on A defined as '*a* R *b* if and only if *a* and *b* have same area, where *a* and *b* belong to A'. Then R is an equivalence relation on A. **6**

(b) Let $A=\{3, 4, 5, 6\}$, $B=\{5, 8, 9, 10\}$ and $C=\{4, 8, 11)$ **5**

Find $\sim (A \sim B) \cup (\sim C)$, where '$\sim$' is complementation symbol.

(c) Draw Hasse diagram for the set $X=\{1, 2, 3, \text{-----}, 16\}$ w.r.t the relation "divides". **4**

5. (a) Draw Venn Diagram showing : **4**

(i) $A \cap B=\phi$,

(ii) $C \cap B \neq \phi$ and

(iii) $C \cap A \neq \phi$, where A, B and C are sets.

(b) Among 100 students in a class, 52 got grade 'A' in the first examination, and 42 got grade 'A' in the second examination. **5**

If 34 students did not get an 'A' in either examination, then how many students got 'A' in both the examinations.

(c) Let $X = \{a, b, c, d\}$ and $Y = \{5, 6, 7, 8\}$ and $f : X \to Y$ be defined as $f = \{(a, 5), (b, 6), (c, 5), (d, 7)\}$ then show f is a function, but f^{-1} is not a function. **6**

6. (a) If $f : X \to Y$ and $g : Y \to Z$ be one-one and onto functions, then show that $gof : X \to Z$ is also one-one and onto function. **6**

(b) Using truth-table, find whether the following is a tautology or not : **4**

$[(p \to q) \wedge \sim q] \to \sim p$, where p and q are statements / propositions.

(c) Find whether the two formulae : **5**

(i) $(p \wedge q) \vee (\sim p)$ and

(ii) $(\sim p) \vee q$

are logically equivalent or not.

7. (a) Draw Venn diagram for $(X \cup Y) \cap Z$ where **5**

$X \cap Y \neq \phi$ $X \cap Z \neq \phi$ and $Y \cap Z \neq \phi$.

(b) If $A = \{a, b, c, d, e, f, g\}$ and **4**

$B = \{c, d, 1, 2, 3, 4\}$,

then find $A \Delta B$.

(c) If $f = \begin{pmatrix} 2 & 4 & 3 & 1 \\ 1 & 2 & 4 & 3 \end{pmatrix}$ and $g = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 2 & 4 & 3 & 1 \end{pmatrix}$ are two permutations, then find permutations $(f\,g)$ and $(g\,f)$. **6**