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SARDAR PATEL UNIVERSITY
M. Sc. Information Technology
Semester – I External ATKT Examinations
PS01CINT03 – Introduction to Theoretical Computer Science
7th April 2016, Thursday

Time: 10:30 a.m. to 01:30 p.m.   Max Marks: 70

Q-1   **Choose the most appropriate option for each question.**   [8]

1. $X + X' = 1$ is _____.

   (A)   Idempotent Law   (C)   Complement Law

   (B)   Identity Law   (D)   Involution Law

2. Maximum number of edges in simple graph is _____.

   (A) $n(n-1)/2$ (B)   n-2   (C)   n/n-2   (D)   None of these

3. _____ is used to denote the universal lower bound and _____ is used to denote universal upper bound.

   (A)   0, 0   (B)   1, 0   (C)   1, 1   (D)   0, 1

4. Replacing meet operation over join and join over meet operation is known as _____.

   (A)   Principle of membership   (C)   Principle of lattices

   (B)   Principle of duality   (D)   None of these

5. The Cardinality of a set A is denoted by notation like_____

   (A)   {A}   (B)   [A]   (C)   <A>   (D) |A|

6. According to modus tollens if P => Q and ~Q is true then _____ is true.

   (A)   ~P   (B)   P   (C)   Q   (D)   ~P V Q

7. A phrase structure grammar with no restriction is referred as _____ grammar.

   (A)   type – 0   (B)   type – 1   (C)   type – 3   (D)   None of these

8. _____ reflects the dynamic pace of movements of a phenomenon over a period of time.

   (A)   Time series   (C)   Statistics

   (B)   Frequency distribution   (D)   None of these

(1)

Q-2 Answer the following questions (Any Seven): [14]

a. Define with and example: Lattice, Complete Lattice.

b. Explain Weighted graphs and multigraphs.

c. Draw Hasse diagram for the <S60,D> POSET.

d. Draw a Truth table for $(P \wedge Q) \vee (P \wedge R)$.

e. Explain utilities of time series with example.

f. Define Algorithm.

g. List the components of time series.

h. Construct a grammar for the language $L = \{a^i b^{2i} / i >= 1\}$.

i. List the major components of phase structure grammar.

Q-3 Answer the following questions:

a. Explain properties of binary relations with suitable example. [6]

b. Write a note on Injective and Bijective Functions. [6]

OR

b. Write the shortest path algorithm. [6]

Q-4 Answer the following questions:

a. Discuss tractable and intractable problems in detail. Also specify what is class of NP problem? [6]

b. Explain the use of lattices in design and implementation of digital networks in detail by taking appropriate example. [6]

OR

b. Discuss Boolean Lattices and Boolean Algebra in detail with example. [6]

Q-5 Answer the following questions:

a. Fit a Straight line trend for the following series. Estimate the value for 2015. [6]

Year	2004	2005	2006	2007	2008	2009	2010
Earnings (Rs. Lakhs)	60	72	75	65	80	85	95

b. Write a De Morgan's Law and Prove them using truth table. [6]

OR

b. Determine trend of the following data using Semi-Average method and estimate the value for 2017. [6]

Year	2010	2011	2012	2013	2014	2015
Profit	20	24	22	30	28	32

Q-6 Answer the following questions:

a. Write a note on fuzzy logic. Also explain fuzzy sets in brief. [6]

b. Given R and S are relation defined over sets $\{1,3,5\} \times \{1,3,5\}$ such that $R= \{(x,y) \mid y = x+2\}$ and $S= \{(x,y) \mid x<y\}$. Find Max-min composition R o S. [6]

OR

b. Let fuzzy set $\tilde{A} = \{(x1,0.3)(x2,0.8)(x3,1)\}$ and $\tilde{B} = \{(x1,0.4)(x2,0.1)(x3,0)\}$ be two fuzzy sets defined on universe of disclosure X. Perform the following operations: [6]

(1) Find $\tilde{A} \cup \tilde{B}$ (2) Find $\tilde{A} \cap \tilde{B}$ (3) Find $\tilde{A}^c$

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