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[5.3]

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

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 ∧ Q) V (P ∧ 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} X {1,3,5} such that R= {(x,y) | y = x+2} and S= {(x,y) | 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 $\tilde{A}^c$

NNN