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SARDAR PATEL UNIVERSITY

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M. Sc. Information Technology

Semester – I External ATKT Examinations

PS01CINT03 – Introduction to Theoretical Computer Science

25th April 2015

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

Q1. Choose the most appropriate option for each question. **[8]**

[1] "Number of fish in Indian Ocean" set is

[A] Finite **[B]** Countable finite

[C] Uncountably finite **[D]** None of these

[2] IF A ={5,7,8} and B ={2,5,9,11,12}, then A- B equals

[A] {2,5,7,8,9} **[B]** {7,8}

[C] {2,5,7,8,9,11,12} **[D]** None of these

[3] A Lattice (L, ≤) is called a _____if it has a greatest element denoted by 1 and a least element denoted by 0.

[A] Grounded Lattice **[B]** Complete Lattice

[C] Bounded Lattice **[D]** Complemented Lattice

[4] A decline or changes that have occurred in ice-cream sales during November to February is called _____variation.

[A] Trend **[B]** Seasonal

[C] Cyclic **[D]** Irregular

[5] According to rule of product if experiment 1 has 7 outcomes and experiment 2 has 3 outcomes then there are _____ possible outcomes.

[A] 10 **[B]** 11

[C] 20 **[D]** 21

[6] The size of set {{a,b}} is _____.

[A] 1 **[B]** 2

[C] 3 **[D]** None of these

[7] A function $f: A \rightarrow B$ is said to be _____ if for each $b \in B$, there exists at most one $a \in A$ with $f(x) = y$.

[A] Bijective **[B]** Injective

[C] Surjective **[D]** Objective

[8] If there is an edge (a, b) between vertex a and b, then vertex a is said to be _____ to vertex b.

[A] adjacen **[B]** non-terminal

[C] equal **[D]** None of these

Q2. Answer the following questions (Any Seven): **[14]**

a. Define with an example: Lattice; Bounded Lattice.

b. Explain rule of sum and product.

c. Explain Weighted graphs and multigraphs.

d. Draw a Truth table for (P Λ Q) V (P Λ R).

e. Explain in brief Infinite sets.

f. Define with an example: Binary relation.

g. What is isomorphic graph? Give an example.

h. Define and give any one example of fuzzy set.

i. State that the formula $(P\ V\ Q) \Longrightarrow (\sim P)$ is a tautology or not by giving truth table.

Q3. Answer the following questions:

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

b. Explain Phrase Structure grammar with example. Also explain how phrase structure grammar can be used to specify language. **[6]**

OR

b. Define Algorithm. Write down the LARGEST1 algorithm to find largest value from n numbers. **[6]**

Q-4 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. Explain components and utilities of time series with example. **[6]**

OR

b. Fit a parabola $Y = a + b\,X + c\,X^2$ using given data: **[6]**

Year	2011	2012	2013	2014	2015
Production('000)	5	7	4	9	10

Estimate the value for 2018.

Q-5 Answer the following questions:

a. Explain Boolean Algebra and Boolean Lattices in detail. **[6]**

b. Write a detailed note on complexity of problems. **[6]**

OR

b. Prove that in a graph G with n vertices, if there is a path from vertex v1 to vertex v2 , then there is a path of no more than n -1 edges from vertex v1 to vertex v2. **[6]**

Q-6 Answer the following questions:

a. Let G be a linear graph of n vertices. If the sum of the degrees for each pair of vertices in G is n-1 or larger, than prove that there exists a Hamiltonian path in G. **[6]**

b. Mention fuzzy relations (i) Union, (ii) Intersection and (iii) Complement by giving an example of each. **[6]**

OR

b. Define fuzzy proposition and solve the following **[6]**

Let $\tilde{P}$: *Jessica is efficient* $T(\tilde{P}) = 0.7$

And $\tilde{Q}$: *John is efficient* $T(\tilde{Q}) = 0.55$

(i) $T(\tilde{P}\ V\ \tilde{Q})$ *Either Jessica or John is efficient*

(ii) $\tilde{P} \Longrightarrow \tilde{Q}$ *If Jessica is efficient then so is John.*

ΠΠΠ