

[23]

SEAT No. \_\_\_\_\_

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**SARDAR PATEL UNIVERSITY**  
**M.Sc.(Information Technology)**  
**SEMESTER-I**

External Examination (NC)  
**PS01CINT21- Introduction to Theoretical Computer Science**  
 19<sup>th</sup> March, 2019, Tuesday

Time: 10:00am to 1.00pm

Marks: 70

Q1

Give answers of following Multiple choice questions

[8]

- 1 A relation which is reflexive, symmetric and transitive is known as \_\_\_\_\_ relation.  
 A reflexive B Equivalence  
 C Unbounded D None of these
- 2 A set  $A = \{a, b, c\}$  is an example of \_\_\_\_\_ set.  
 A finite B Uncountable  
 C Infinite D Uncountable and Infinite
- 3 A decline or changes that have occurred in Mango sales during November to February is called \_\_\_\_\_ variation.  
 A Trend B Seasonal  
 C Cyclic D Irregular
- 4  $a \wedge a = a$  is \_\_\_\_\_  
 A Commutative property B Absorption property  
 C Idempotent property D Associative property
- 5 \_\_\_\_\_ is a set of statistical observations arranged in chronological order.  
 A Statistical series B Time series  
 C Observations D None of these
- 6 Increase the price of vegetable during heavy rain is known as \_\_\_\_\_ variation.  
 A irregular B Seasonal  
 C Trend D Cyclic
- 7 Total number of edges in a complete graph  $K_5$  is \_\_\_\_\_.  
 A 4 B 6  
 C 8 D 10
- 8 R be a relation defined on a set A, then R is \_\_\_\_\_ if a R a holds all a belongs to A i.e.  $\{a, a\}$ .  
 A Reflexive Relation B Symmetric Relation  
 C Asymmetric Relation D Relative Relation

Q2

Do as directed (Any 7)

[14]

- 1 Construct a Circuit diagram for: (1)  $X'Y + XY'$  (2)  $(XY' + X'Y)Z$
- 2 Define countable infinite sets? Give one example.
- 3 Define tractable and intractable problem.
- 4 Define time complexity of algorithm. Write down the time complexity of bubble sort algorithm.
- 5 With the help of truth table prove that  $x \vee (y \vee z) = (x \vee y) \vee z$ .
- 6 Explain rule of sum using with examples.
- 7 Write down all the formulas for 2<sup>nd</sup> degree parabola.
- 8 What is difference between Path and Circuit in graph?
- 9 Explain graph and subgraph with suitable example.

Q3 [A] What is POSETS? Explain properties of POSETS. Draw the Hasse diagram of  $\langle S_4, D \rangle$ . [6]

Q3 [B] Define a binary relation. Briefly Explain Symmetric, Antisymmetric and Transitive Relations using with proper example. [6]

OR

Q3 [B] Define Lattice. List the types of lattice and explain any 2 with example. [6]

Q4 [A] Write down the algorithm to find the shortest path in a weighted graph. [6]

Q4 [B] Define graph. Discuss different applications of graphs in detail. [6]

OR

Q4 [B] Write down the LARGEST1 and LARGEST2 algorithm to find largest number among given "n" numbers. [6]

Q5 [A] Fit a straight line trend for the following data: [6]

Year	2000	2001	2002	2003	2004
Earnings (Rs. Lakh)	5	7	4	9	10

Q5 [B] Explain Time Series components (i) Secular Trend and (ii) Irregular Variation. [6]

OR

Q5 [B] Calculate 5 -Yearly moving average for the following data to the numbers of products failures in manufacturing industries during 2004 to 2019. [6]

Year	No. of Failures	Year	No. of Failures	Year	No. of Failures	Year	No. of Failures
2004	23	2008	20	2012	9	2016	12
2005	26	2009	12	2013	13	2017	9
2006	28	2010	12	2014	11	2018	3
2007	32	2011	10	2015	14	2019	1

Q6 [A] Below is given the Birds population of INDIA(2015-2019) [6]

T	2015	2016	2017	2018	2019
Y	8	9	8	9	16

T:Year; Y:Population ('in millions')

Fit a Straight line and determine the population for the year 2023

Q6 [B] Define Time Series and discuss utilities of Time Series in detail. [6]

OR

Q6 [B] Define algorithm. List the characteristics of good algorithm. [6]

—X—  
(2)