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SARDAR PATEL UNIVERSITY

M.Sc.-IT Master of Science in Information Technology

Semester – I (NC) External Examinations, April 2018

PS01CINT21 – Introduction to Theoretical Computer Science (NC)

Tuesday, 10th April, 2018

Time: 02:00 p.m. to 05:00 p.m.

Max Marks: 70

Q1. Choose the most appropriate option for each question.

[8]

i. The set $A = \{a,b\}$ is an example of _____ set.

- A) finite
B) Uncountable
C) Infinite
D) Uncountable and Infinite

ii. Let set $A = \{a,b,c\}$ and Relation $R = \{(a,a), (b,b), (c,c)\}$ then R is _____ relation.

- A) Anti symmetric
B) Asymmetric
C) Reflexive
D) Transitive

iii. The _____ of vertex is number of edges passing through it.

- A) Eccentricity
B) Center
C) Degree
D) none of these

iv. A path is said to be _____ if it does not meet the same vertex twice.

- A) elementary
B) secondary
C) subsidiary
D) none of these

v. Time complexity of bubble sort algorithm is _____.

- A) $N(N-1)/2$
B) $N-1/2$
C) $N/2$
D) none of these

vi. The main measurement of efficiency of algorithm is given by _____ efficiency.

- A) Data and Space
B) Time and Space
C) Capacity and Complexity
D) none of these

vii. 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

viii. The oscillatory movements in a time series with period of oscillation greater than one year are termed as _____.

- A) random variation
B) irregular variation
C) seasonal variation
D) cyclical variation

Q2. Answer the following questions (Any Seven):

[14]

- Define binary relation and give one example.
- Explain transitive relation with example.
- Define rule of sum and rule of product.
- In Graph, what is difference between path and circuit?

- e. Define isomorphic graph and give one example.
- f. Define tractable and intractable problem.
- g. Write steps for largest 1 algorithm.
- h. Give uses of time series.
- i. State the methods for measurement of the trend component in a time series.

Q3. Answer the following questions:

- a. Write a note on injective and bijective functions. [6]
- b. Discuss basic properties of lattice along with join and meet operation. [6]

OR

- b. Explain Symmetric, Anti Symmetric and Equivalence relation with example for each. [6]

Q4. Answer the following questions:

- a. Define graph. Discuss different applications of graphs in detail. [6]
- b. 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, then there exists a Hamiltonian path in G. [6]

OR

- b. Discuss (i) Euler and (ii) Planner graphs with example. [6]

Q5. Answer the following questions:

- a. Explain shortest path algorithm in detail. [6]
- b. Write a note on complexity of problems. [6]

OR

- b. Explain knap sack problem in detail. [6]

Q6. Answer the following questions:

- a. Explain time series components (i) Secular Trend and (ii) Irregular Variation [6]
- b. Fit a Straight line trend by the method of Least Squares. Calculate the Trend Values. Estimate the value for 2022. [6]

Year	2011	2012	2013	2014	2015	2016	2017
Earnings (Rs. Lakh)	70	75	90	91	95	98	100

OR

- 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
