



**WEST BENGAL STATE UNIVERSITY**  
B.Sc. Programme 5th Semester Examination, 2020, held in 2021

**MSGDSE02T-COMPUTER SCIENCE (DSE1)**

**DISCRETE STRUCTURES**

Time Allotted: 2 Hours

Full Marks: 50

*The figures in the margin indicate full marks.  
Candidates are required to give their answers in their own words as far as practicable.  
All symbols are of usual significance.*

**Answer Question No. 1 and any five from the rest**

1. Answer any *five* questions from the following: 2×5 = 10
- (a) Define power set of a set.
  - (b) State Pigeonhole Principle.
  - (c) Between the Polynomial time algorithm and Exponential time algorithm, which one is faster and why?
  - (d) What is Hamiltonian Circuit?
  - (e) Construct the truth table for  $(p \rightarrow (q \rightarrow r)) \wedge p$ .
  - (f) What do you mean by a path of a graph? Explain with diagram.
  - (g) With an example, show the difference between function and relation.
  - (h) When a graph is called universal graph? Give a suitable example.
  - (i) Define Euler graph.

**Answer any five questions from the following**

8×5 = 40

2. (a) State the Principle of Inclusion and Exclusion for four sets  $A, B, C$  and  $D$ . 3+5
- (b) Determine the number of integers between 1 and 250 that are divisible by one of the integers 2, 3, 5 and 7.
3. (a) Let  $A$  and  $B$  the two finite sets, then prove that  $|A \cup B| = |A| + |B| - |A \cap B|$  4+(2+2)
- (b) Give an example of
- (i) a function which is injective but not surjective.
  - (ii) a function which is surjective but not injective.

4. (a) A graph is a tree if and only if it is minimally connected. 4+4  
(b) Prove by mathematical induction that:  $3^n - 1$  is divisible by 8, for all natural number  $n$ .
5. (a) Prove that a connected graph with  $n$  vertices and  $(n-1)$  edges is a tree. 4+4  
(b) Define Edge-connectivity and Vertex-connectivity of a graph. Give example.
6. Suppose a laundry bag has many red, white and blue socks. Find the minimum number of socks that one needs to choose in order to get two pairs (four socks) of the same colour. Describe the Kruskal's algorithm. 4+4
7. (a) What is Adjacency matrix of a graph  $G$ ? State two of its characteristics. What is path matrix? (2+2+2)+2  
(b) Define with suitable example the terms eccentricity and centre of a graph.
8. (a) Define with proper figure: 6+2  
(i)  $O$  (Big-Oh) notation  
(ii)  $\Omega$  (Big-Omega) notation  
(iii)  $\Theta$  (Big-Theta) notation.  
(b) Give  $O$  (Big-Oh) estimation for  $(x) = (x+1) \log(x^2 + 1) + 3x^2$

**N.B. :** *Students have to complete submission of their Answer Scripts through E-mail / Whatsapp to their own respective colleges on the same day / date of examination within 1 hour after end of exam. University / College authorities will not be held responsible for wrong submission (at in proper address). Students are strongly advised not to submit multiple copies of the same answer script.*

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