

**B.Sc. (Honours) Examination, 2019**  
**Semester-II (CBCS)**  
**Computer Science**  
**Course : CC-4**  
**(Discrete Structures)**

**Time : 3 Hours**

**Full Marks : 60**

Questions are of value as indicated in the margin

**Part - A**

Answer question **any four** questions

1. a) Prove that  $n^2 \leq 2^n \forall n \geq 4$ .  
b) Find the number of integers from 1 to 200 that are not divisible by any one of the numbers 3, 5, 7. 5+5=10
2. a) Let  $(P, \leq)$  be a partially ordered set. Suppose, the length of the longest chain in P is n. Prove that P can be partitioned into n-disjoint anti-chains.  
b) Show that if 101 integers are chosen from the set  $\{1, 2, \dots, 200\}$  then one of the chosen integers divide another one in this chosen set of 101 integers. 4+6=10
3. a) Define convolution of two discrete numeric functions.  
b) Let a, b be two discrete numeric functions and  $c = a * b$  then prove that  $C(Z) = A(z) \cdot B(z)$ .  
c) Use generating functions to prove that

$$1 + 2 + 3 + \dots + r = \frac{r(r+1)}{2} . \quad \text{1+3+6=10}$$

4. a) Solve the recurrence relation  $a_r - 2a_{r-1} + a_{r-2} = 7$ .  
b) Find the particular solution of  
 $a_r = a_{r-1} + 7$ . 6+4=10
5. a) Use generating function to solve the recurrence relation  
 $a_r = 3a_{r-1} + 2, \quad r \geq 1$  where  $a_0 = 1$ .  
b) Prove that, if an element has a complement in a distributive lattice, then this complement must be unique. 5+5=10
6. a) Define a statement form.  
b) What do you mean by logical equivalence of two statement forms?  
c) Verify if  $\sim (p \vee q) \equiv \sim p \wedge \sim q$ .  
d) Verify the validity of the following argument form :  
     $\cdot p \wedge q$   
     $\cdot p \Rightarrow q$   
Therefore, q. 1+2+3+4=10

**Part-B**

Answer **any two** questions

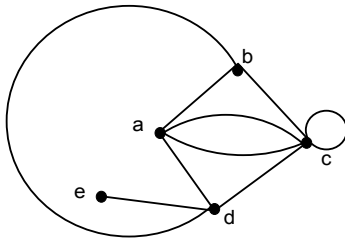
7. a) Define the following :
  - i) self loop
  - ii) parallel edge
  - iii) isolated vertex

(2)

iv) pendant vertex

v) degree of a vertex

- b) Define the center of a tree. How will you find the center of any tree? 5+5=10
8. a) Define a binary tree? What is the relationship between  $n$  and  $p$ , where  $n$  is the number of vertices and  $p$  the number of pendant vertices in a binary tree.
- b) How can you find all spanning trees in a graph? Explain using a suitable example. 5+5=10
9. a) Find the geometric dual of the following graph and write your observation.



- b) What are the advantages and disadvantages of incidence matrix over adjacency matrix? 5+5=10

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