## B.C.A. (Part–I) Semester–I Examination

## DISCRETE MATHEMATICS

### Paper–1ST5

Time : Three Hours] [Maximum Marks : 60

**Note :—** Attempt **one** question from each unit.

### UNIT–I

1. (a) Among the integers 1 to 1000, how many are not divisible by 5 and 7 but divisible by 3 ? 6

   (b) State and prove principle of inclusion exclusion for three sets. 6

2. (p) Define : (i) one-one function (ii) onto function (iii) composite function. Give one example of each. 6

   (q) Define Countability and prove that if A and B are Countable then A×B is also countable. 6

### UNIT–II

3. (a) Define ordinary generating function and exponential generating function. Determine the sequence for the generating function :

   (1) $e^{2x}$ (2) $(1+x)^{-1}$ 6

   (b) Define Ferrer's and Conjugate Ferrer's diagram and Draw both 7+5+3+2+1 of 18. 6

4. (p) Find the coefficient of $x^{16}$ in the series $(x^2+x^3+x^4+.....)^5$. 6

   (q) Define probability generating function and prove that E(x) = P'x(1). 6

### UNIT–III

5. (a) Define Recussive formula and find recurrence relation for the infinite sequence :

   (i) 3,7,11,15,19,23..... (ii) 4,6,8,10,12,..... 6

   (b) Find particular solution of $a_r - 7a_{r-1} + 10a_{r-2} = 8r + 6$ 6

6. (p) Find Homogeneous solution of $a_r - 8a_{r-1} + 16a_{r-2} = 0$ with initial conditions $a_2 = 16$, $a_3 = 48$. 6

   (q) Find Total solution of $a_r - 10a_{r-1} + 25a_{r-2} = 2$ 6

### UNIT–IV

7. (a) Find the truth values of the following statements :

   (i) 2+5=7 and 4+2=6 (ii) 10+2=7 or 11+2=14

   (iii) 1+3=9 and 2+5=7 (iv) 4+2=7 and 3+7=10

   (v) 13+2=15 or 10+3=13 (vi) 1+1=2 and 2+4=6 6

   (b) Prove that both join and meet operations are associative. 6

(p) Prove that both join and meet operations are distributive. 6

(q) Find the duals of the following :

(i) $a \geq b$

(ii) $a \wedge (a \vee b) = a$

(iii) $a \wedge (b \wedge c) = (a \wedge b) \wedge c$

(iv) $(a \vee b) \leq b$

(v) $\bar{a} \geq 1$

(vi) $a \leq 0$ 6

## UNIT–V

9. (a) Prove that in a distributive lattice if an element has complement then this complement is unique. 6

(b) If B is the sets of statements from closed under $\wedge$, $\vee$ and $\sim$. Show that $< B, \wedge, \vee, \sim, c, t >$ is Boolean algebra where C is contradiction and t is tautology. 6

10. (p) If a distributive lattice if zero and unit element is complemented then prove that for any x, the inverse x' is unique. 6

(q) Find disjuction normal form of $(x \vee y) \wedge (x' \vee y')$. 6