

B.C.A. Part—I Semester—I (Old) Examination
DISCRETE MATHEMATICS
Paper—1 ST 5

Time : Three Hours] [Maximum Marks : 60

Note :— (1) All questions are compulsory.

- (2) All questions carry equal marks.
- (3) Assume suitable data wherever necessary.

1. (A) Explain with examples :

- (i) Inverse function
- (ii) One to one function. 6

(B) Prove principle of inclusion and exclusion for 2 finite sets. 6

OR

2. (A) Among integers 1 to 1000, how many integers are divisible by 2 or 7 ? 6

(B) Using combinatorial arguments, prove that :

$$\sum^n C_r 1 = 2^n . \quad 6$$

3. (A) Find E.G.F. and O.G.F. for $\langle 1, -1, 1, -1, 1, \dots \rangle$. 6

(B) Draw Ferrer's and conjugate Ferrer's diagram for $7 + 5 + 3 + 2 + 1$ of 18 partitions. 6

OR

4. (A) Find coefficient of x^5 in the series $(x^3 + x^4 + x^5 + \dots)^5$. 6

(B) Explain ordinary generating function. Find O.G.F. for, $\langle 0, 1, 2, 3, 4, \dots \rangle$. 6

5. (A) Find homogenous solution of $a_r - 7a_{r-1} + 10a_{r-2} = 0$ with initial conditions $a_0 = 4$ and $a_1 = 17$. 6

(B) Find particular solution of $a_r - 2a_{r-1} + 4a_{r-2} = 3r$. 6

OR

6. (A) Write steps to find homogenous solution of a recurrence relation. 6

(B) Find total solution of $a_r - 6a_{r-1} + 9a_{r-2} = 4$. 6

7. (A) In a lattice, prove that :

- (i) $a \vee (a \wedge b) = a$
- (ii) $a \vee b = b \vee a$. 6

(B) State principle of duality with an example. 6

OR

8. (A) Prove that meet and join operations are both associative. 6
- (B) Find duals of :
- (i) $(\overline{a \vee b}) = 1$
 - (ii) $a \geq b$
 - (iii) $a \leq 0.$
9. (A) Find D.N.F. of $(x \wedge y) \vee (x' \wedge y')$. 6
- (B) In a distributive lattice, with zero and unit element is complemented, then for any x prove that inverse x' is unique. 6

OR

10. (A) Prove that complemented distributive lattice, $\langle L, \leq \rangle$ with $0 \neq 1$ determines a Boolean algebra $\langle L, \wedge, \vee, ', 0, 1 \rangle$. 6
- (B) Let D_{30} be a set of all positive divisors of 30 for $X, Y, \in D_{30}$.
- $x \wedge y = \text{gcd } \{X, Y\}$ and
- $x \vee y = \text{lcm } \{X, Y\}$
- $$X' = \frac{30}{X}.$$
- Prove that $\langle D_{30}, \wedge, \vee, /, 30 \rangle$ is Boolean algebra. 6