DISCRELE MATHEMATICAL - II

Paper - III

Time : Three Hours] [Maximum Marks : 40

Note : Attempt *two* questions each from Section A and B carrying 8 marks each, and the entire Section C consisting of 10 short answer type questions carrying 8 marks in all.

Section - A

1. (a) Find the sequence for which $1/(1-z-z^2)$ is the generating function. 4

(b) Let a and b denote the positive integers. Suppose a function Q is defined as

$$Q(a,b)=\begin{cases} 0; & \text{if } a \le b \\ (a-b,\ b); & \text{if } b \le a \end{cases}$$

Find Q (2, 3) and Q (14, 3). 4

2. Explain the generating function, and using generating function, find the explicit formula for Fibonacci sequence. 8

3. Find the solution fo recurrence relation

$$S_n - 6S_{n-1} + 8S_{n-2} = n.4^n.$$

Given $S = 2$, $S_1 = 5$.

4. Consider an n-digit number from the squence 1, 2, 3, ... 8; 9, 0. If even number of 0 digit occurs in it then such a number is considered for use as a valid code word for a computer system. Find the recurrence relation for the number of valid strings a_n, and solve it. 8

Section - B

5. (a) Simplify the Booleam expression

$$f(x,y,z)=(\bar{x}\wedge z)\vee(y\wedge z)\vee(y\wedge\bar{z})$$

and write in mintern normal form.

(b) Show that the Boolean functions $f_1 = (x_1 \vee x_2) \vee x_3$ and $f_2 = x_1 \vee (x_2 \vee x_3)$ are equivalent. 4

6. Define Complemented lattice and Distributive lattice. Show that De-Morgan's law holds in complemented distributive lattice. 8

7. Show that the following are equivalent in Boolean algebra :

(a) a + b = b.

(b) a * b = a.

(c) a' + b = 1.

(d) a * b' = 0. 8

8. (a) Prove that algebra of switching circuit is a Boolean algebra. 8

(b) Draw the switching circuit for f = a + a' (+ b) + ab. Simplify it and draw equivalent circuit. 8

Section - C

9. Attempt all the following :

(a) Define Non-abelian group with suitable example. 1

(b) Define Atom with suitable example. 1

(c) Draw the Hasse diagram of (P(A), ⊆), where A = {a, b, c} 1

(d) Find the generating function of a sequence $a_n = 2^{n+3}$ for $n \ge 0$. 1

(e) Show that indempotent laws follows from absorption laws in a lattice. 1

(f) Check whether D_{12} is a lattice or not. 1

(g) Define Lattice as an algebraic structure. ½

(h) Prove that generating function of sum of two sequences is equal to sum of their generating functions. ½

(i) Prove that complement of an element in a Boolean algebra is unique. ½

(j) Show that every finite lattice is complete. ½