## DISCRETE MATHEMATICS - II

Paper - IV (Semester - VI)

lowed: 3 Hours]
The candidates are required to attempt two questions each from Section A and B carrying 5.5 Time Allowed: 3 Hours] marks each and the entire Section C consisting of 10 short answer type questions carrying 1.4 marks each.

- Section A

  Give Big-O estimate for  $f(n) = 3n \log n! + (n^2 + 3) \log n$ .

  Prove that  $f(x) = 8x^3 + 5x^2 + 7$  is  $\Omega(g(x))$ , where  $g(x) = x^3$ .

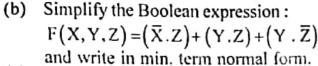
  Solve  $S_n + 5S_{n-1} + 6S_{n-2} = 3n^2 2n + 1$ .
- (b) Find sequence whose generating function is 1-z-z².
   (a) Solve recurrence relation S(n) 4S(n-2) = 0, S(0) = 10, S(1) = 1 for n ≥ 0 using generating 3. function.
- (b) For S(n) = 3" verify that G(S \* a, Z) = G(S, Z) G(a, Z).

  (a) For the requirence relation a = 8a + 10n<sup>-1</sup> with initial condition a<sub>0</sub> = 1. Find the generating function and the explicit formula for a sequence of Fibonacci numbers.

  (b) Find generating function for the sequence of Fibonacci numbers.

  Section B

- Prove that set D of all positive divisors of an is a bounded distribution lattice. Prove that for a bounded distributive lattice L, the complements are unique if they exist.
- Find the circuit  $(x_1,(x_1-\overline{x}_3)+(\overline{x}_2,x_3))+(\overline{x}_1,x_2,x_3)$ .



- 7. Minimize the logic programme using K map:  $f(A, B, C, D) = \sum_{i=1}^{n} (0, 1, 2, 3, 5, 7, 8, 9, 10, 4).$ 
  - (b) Reduce using Boolean rules  $xy + xz + yz = xy + (x \oplus y)z$ .
- Write the function  $x \vee y'$  in the disjunction normal form in three variables x, y and z. 8.
  - (b) Simplify the Boolean expression and make circuit diagram using NAND gate only.  $F(A, B, C, D) = \overrightarrow{ABCD} + \overrightarrow{ABCD} + \overrightarrow{ABCD}$

 $+A\overline{B}CD + ABC\overline{D} + ABCD$ Section - C

- Define ceiling function and characteristic function. If f be mod-11 function then find the value of f(-253).
  - The numeric value of a defined as  $a_r = \begin{cases} 2^{-r} + 5, r \ge 4 \end{cases}$ , find  $S^{-2}$  a.
  - Determine C(5, 3) by recursive definition ob binomial coefficient.
  - Write short note on recursion.
  - Show that n, nth root of unity forms a group under multiplication.

  - Prove that inverse of an element of group is unique. Draw operation table of  $G = \{0, 1, 2, 3, 4, 5\}$  under multiplication modulo 6.
  - Define ring and sub ring.

    Prove that dual of distribution lattice is distributive.  $10 \times 1.4 = 14$