D-5316

M.A./M.Sc. (Ist Semester)
Examination, 2020
MATHEMATICS
(Advanced Discrete Mathematics - I)

Time Allowed : Three Hours

Maximum Marks : 70

Note : Attempt all sections as per instruction given.

SECTION - A

(Objective Type Question)

Q. 1. Choose the correct option :   **2×5=10**

(i)   An element x in a semigroup (S, ∗) is called

an idempotent if :

(a) $x = x$

(b) $x + x = x$

(c) $x^2 = x$

(d) $x = 1$

(ii) Evey finite lattice is :

(a)   Partially bounded

(b)   Unbounded

(c)   Bounded

(d)   None of these

(iii) In a Boolean algebra B if a + x = b + x and

$a + x' = b + x'$ then :

(a) $a = a'$

(b) $a' = b$

(c) $a = b$

(d) $a = x'$

(iv) The set of language generated by regular

grammar is called :

(a) Phase structure grammar

(b) Production rule

(c) Regula set

(d) None of these

(v) An elements a and b of a Boolean algebra B

then it is called Demorgan's law :

(a) (a + b)' = a'b'

(b) (ab)' = a' + b'

(c) Both (a) and (b)

(d) None of these

SECTION - B

(Very Short Answer Type Questions)

Q. 2. Answer the following questions in two or three

sentences each (attempt any five) :　　**5×2=10**

(i) What is semigroup ?

(ii) Define Automorphism.

(iii) What is phrase structure grammar ?

(iv) Define Regular grammar.

(v) Define Boolean function.

(vi) Write a Demorgan law for Boolean

algebra.

(vii) Define isomorphism of semigroup.

(5)

SECTION - C

(Short Answer Type Questions)

Note : Attempt any 5 questions.   **5×4=20**

Q. 3. (i) Prove that the statement $(p \lor q) \Leftrightarrow (\sim p \land \sim q)$

     is a tautology.

(ii) Discuss absorption law for Boolean

     algebra.

(iii) Construct a grammar for the language

     $L = \{a^i b^{2i} : i \geq 1\}$.

(iv) Define Lattice give an example.

(v) Change the following functions to disjuctive

     normal forms of three variables x, y, z :

(6)

     (a) $x + y'$

     (b) $x'z + xz'$

(vi) Prove that every semigroup has an

     idempotent element.

(vii) Express the three connective $\lor$, $\land$ and $\sim$ in

     terms of the connective $\perp$.

SECTION - D

(Long Answer Type Questions)

Note : Attempt any three questions.   **3×10=30**

Q. 4. (i) Show that dual of a lattice is a lattice.

(ii) State and prove fundamental theorem of

     homomorphism of semigroups.

(7)

(iii) Draw a switchen circuit and simplified

switchen circuit of the following expression :

F(x, y, z) = xy'z + (z + y)x' verify it.

(iv) Define grammar and language over

grammar, consider the grammar G = (N, T,

P, S) where N = {S, A}, T = (a, b) and P =

{S → aA, S → b, A → aa} with start symbol

S. Find L(G).

———————