AH– 1544 CV-19 S

(052) M.Sc. (Previous) Mathematics
Examination 2019-20
Compulsory/Optional
Paper-V
Advanced Discrete Mathematics

Time: Three Hours] [Maximum Marks: 100
[Minimum Passing Marks:-036

Note: Answer all questions. All question carry equal marks

Q. No. Answer any five Question. Answer to each question should begin on a fresh page. All question carry equal marks.

1. Define the following with example.

i. Negation of a Statement ii. Conjunction iii. Disjunction. iv. Tautologies v. Contradiclions.

2. $if\ (L, \leq) is\ a\ Lattice\ then\ for\ any\ a, b, c \in L\ show\ that\ the\ following\ result\ hold.$

i. Idempolent ii. Associative.

3. State and prove the following:

i. Modular Equality ii. Sublattice iii. Direct product of lattice iv. Bounded lattice

v. Complete and complemented lattice.

4. Establish the equivalence of the definitions of a lattice.

5. a. $let\ (L, \leq) be\ a\ lattice\ with\ least\ element\ 0\ and\ greatst\ element\ 1. for\ any\ element\ a \in L, show\ that\ (i) av1 = 1\ and\ a\wedge 1 = a\ \ (ii) av0 = a\ and\ a\wedge 0 = 0$

b. Prove that dual of a lattice is a lattice.

6. a. In a distributive lattice, show that if an element has a complement then this complement is unique.

b. Let L be a Complemental and distributive lattice. Then prove that De'morgan's Laws given by (avb)′ = $a'\wedge$b′ $and\ (a\wedge b)' = a'$vb′ $holds\ in\ L\ where\ a'\ Denotesthe\ complement\ of\ a.$

7. a. Show that complement of an element a in Boolean Algebra B is Unique.

b. Show that the following are equivalent in a Boolean Algebra B.

i. a+b=b, ii. a*b=a, iii. a′+b=1 iv. a*b′=0

8. Define the following with examples.

i. Sub Algebra ii. Karnaugh map iii. Conjunctive normal form iv. Disjunctive normal form.

v. Boolean Algebra as lattice.

9. a. Prove that every finite semigroup has an idempolent element.

b. $Let\ f: s \to T\ be\ an\ outs\ mapping\ from\ a\ semigroup\ (S,*) to\ an\ algebraic\ structure\ (T, o)$

$Where\ o\ is\ binary\ operation\ on\ T. Then\ prove\ that\ if\ f\ is\ a\ semigroup\ homomorphism\ then\ (T, o)$

is a Semigroup.

10. State and prove fundamental theorem of homomorphism of semigroup.