FD-322

M.Sc. 1st Semester
Examination, Dec.-Jan., 2021-22

COMPUTER SCIENCE

Paper - I

Mathematical Foundation of
Computer Science

Time : Three Hours] [*Maximum Marks* : 100

Note : Answer any **two** parts from each question. All questions carry equal marks.

Unit-I

1. (*a*) Define Logical equivalence. Prove that $(p \Rightarrow q) \vee r \equiv (p \vee r) \Rightarrow (q \vee r)$ is logical equivalence.

(*b*) What are the Quantifiers ? Explain universal and existential quantifier with an example.

(*c*) Obtain the principal conjunctive normal form of the formula :

$$(\neg P \Rightarrow R) \wedge (Q \Leftrightarrow P)$$

Unit-II

2. (*a*) Let $(L, \leq)$ be a lattice and $a, b, c \in L$. Then show that

$$a \leq c \Leftrightarrow a \vee (b \wedge c) \leq (a \vee b) \wedge c$$

(*b*) State and prove De Morgan's laws in a Boolean Algebra.

(*c*) Draw switching circuit for the following expressions :

(*i*) $x \cdot y + y' \cdot z$

(*ii*) $(x + y) \cdot (x' + y' + z') \cdot (y' \cdot z')$

Unit-III

3. (*a*) Show that the set of all even integers with zero is an abelian group in addition operation.

(*b*) Prove that the intersection of two normal subgroups is a normal subgroup.

(*c*) Define Ring with an example.

Unit-IV

4. (*a*) Define the following :

(*i*) Degree of a vertex

(*ii*) Planar graph

(*b*) Defien graph and prove that the number of vertices of odd degree in a graph is always even.

(*c*) Prove that a connected graph is a Euler graph if and only if it can be decomposed into circuits.

Unit-V

5. (*a*) Define Tree and prove that a tree with n verties has $n-1$ edges.

(*b*) Define spanning tree and prove that every connected graph has at least one spanning tree.

(*c*) Determine the minimum spanning tree for the following graph :