SCA–273

B.C.A. Part-III Due of Part-II (Supplementary) Examination, 2022

DISCRETE MATHEMATICS

Paper – BCA-205

Time : 1½ Hours]   [*Maximum Marks : 50*

Note :– Attempt *five* questions in all, selecting *one* question from each Unit. All questions carry equal marks.

Unit–I

1. (a) Explain the concept of logical equivalence with suitable example.

    (b) Find the truth table of the following statement :

    $$(p \wedge q) \wedge r \rightarrow p \wedge (q \wedge r)$$

    Or

2. (a) Describe the types of quantifiers with suitable examples.

    (b) Prove that following statement is a tautology :

    $$(p \rightarrow q) \leftrightarrow (\sim q \rightarrow \sim p)$$

Unit–II

3. (a) Prove the following with using mathematical induction :

$$1^3 + 2^3 + 3^3 + \ldots\ldots\ldots n^3 = \frac{1}{4}n^2(n+1)^2 \text{ for } n \geq 1$$

(b) Prove the following using the concept of congruence :

$$a \equiv b \ (\text{mod } n)$$

if and only if $n \mid (a - b)$.

Or

4. Using the concept of mathematical induction, prove that $(10^{2n-1} + 1)$ is divisible by 11 for all $n \in$ N.

Unit–III

5. Give an example of equivalence relation and show how it satisfies the reflexivity, symmetry and transitivity.

Or

6. Describe the concept of partial ordering relation with suitable example.

Unit–IV

7. Draw and explain the working of network corresponding to the following statement :

$$(a + b)(\overline{c \cdot d}) + (c + \overline{d})(b + d)$$

Or

8. Using two examples, explain the concept of representation theorem.

Unit–V

9. Take a suitable graph of six vertices and apply shortest path algorithm to find the shortest path between two vertices.

Or

10. Explain the concept of graph coloring with two applications (real life) in detail.