Q.P. Code : 25131

Second Semester B.Voc. (IT) Degree Examination, May/June 2019

(CBCS Scheme)

Computer Science

DISCRETE MATHEMATICAL STRUCTURES

Time : 3 Hours] *[Max. Marks : 70*

*Instructions to Candidates : Answer any **TEN** questions from Part – A and any **FIVE** questions from Part – B.*

PART – A

1. Answer any **TEN** questions. Each question carries **2** marks : **(10 × 2 = 20)**

(a) List various set operators with an example each.

(b) What are countable sets?

(c) Define probability.

(d) Write the truth table for $\wedge$ and $\vee$ operations.

(e) Show that $p \vee (q \wedge r) \equiv (p \vee q) \wedge (p \vee r)$.

(f) State the induction principle.

(g) Obtain a recursive definition for the sequence $a_n = S_n$.

(h) Let $A = \{1, 2, 3, 4, 6\}$ and R be the relation on A defined by aRb if and only if "a is a multiple of b", write R as a set of ordered pairs.

(i) Define one-to-one and on-to function with example.

(j) Let $A = \{1, 3, 5\}$, $B = \{2, 3\}$ and $C = \{4, 6\}$. Write down $(A \cup B) \times C$.

(k) Define a group with an example.

(l) Define Isomorphism.

PART – B

Answer any **FIVE** questions. Each question carries **10** marks : **(5 × 10 = 50)**

2. (a) A survey among 100 students show that of the three ice cream flavours Vanilla, Chocolate and Strawberry, 50 students like Vanilla, 43 like chocolate, 28 like strawberry, 13 like vanilla and chocolate, 11 like chocolate and strawberry, 12 like strawberry and vanilla and 5 like all of them. Find the number of students surveyed who like each of the following flavours.

   (i) chocolate but not strawberry

   (ii) chocolate and strawberry but not vanilla.

   (b) Let A, B and C be three finite sets prove that :

   $|A \cup B \cup C| = |A| + |B| + |C| - |A \cap B| - |B \cap C| - |C \cap A| + |A \cap B \cap C|$.

   (5 + 5)

3. (a) Prove for any proposition p, v, r following compound proposition $[(p \to q) \wedge (q \to r)] \to (p \to r)$ is a tautology.

   (b) Find explicit formula for $a_n = a_{n-1} + n$ for $n \geq 2$, $a_1 = 4$. **(5 + 5)**

4. (a) A three digit number is formed with the digits 1, 3, 6, 4 and 5 at random find the number of numbers.

   (i) Divisible by 2

   (ii) Not divisible by 2

   (iii) Divisible by 5

   (b) Define the terms with example

   (i) Rules of syllogism

   (ii) Modus Tollens

   (6 + 4)

5. (a) Show that the set of all integers is countable.

   (b) State and prove the pigeon hole principle. **(5 + 5)**

6. (a) If $f : A \to B$ and $B_1 \cdot B_2 \subseteq B$ then show that

   $f^{-1}(B_1 \cap B_2) = f^{-1}(B_1) \cap f^{-1}(B_2)$.

   (b) Let R be a relation represented by the matrix $M_R = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 1 & 0 \\ 1 & 0 & 1 \end{bmatrix}$ find the matrix representing (i) R^{-1} (ii) $\overline{R}$ (iii) R^2.

   (5 + 5)

7. (a) Prove by mathematical induction that for every positive integer $n > 2$, $n! > 2^{n-1}$.

(b) Determine the truth values of the following compound propositions.

(i) $\sim p \vee q$

(ii) $\sim q \rightarrow \sim p$ **(6 + 4)**

8. Evaluate : $S(5, 4)$, $S(8, 6)$, $S(8, 7)$. **(10)**

9. A binary symmetric channel has probability $p = 0.05$ of incorrect transmission. If the word C = 011011101 is transmitted, what is the probability that (a) single error occurs (b) double error occurs (c) triple error occurs and (d) three errors occur no two of them consecutive. **(10)**
