Roll No. | | | | | | | | | | | | **Total No. of Pages : 02**

Total No. of Questions : 07

B.Sc.(IT) (Sem.–2)

MATHEMATICS – II (DISCRETE)

Subject Code : BS-104

Paper ID : [B0406]

Time : 3 Hrs. **Max. Marks : 60**

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains SIX questions carrying TEN marks each and students have to attempt any FOUR questions.**

SECTION-A

Q1) Write briefly :

a) There are 20 people in the room who either drink coffee or tea. If 15 drink tea and 8 drink coffee, how many people drink both?

b) Find the duals of $x(y + 0)$ and $\overline{x} \cdot 1 + (\overline{y} + z)$ where $\overline{x}$, $\overline{y}$ are the complements of x, y.

c) Write the partition for set $A = \{1, 2, 3, 4, 5, 6\}$.

d) Give an example of a relation R which is reflexive, symmetric but not transitive.

e) Write De Morgan Laws for union and intersection.

f) Let $f : R \to R$ then find the inverse of $f(x) = 2x - 1$.

g) Let $f(x) = x^2$, $g(x) = 2x$. Find $f \; o \; g$ and $g \; o \; f$ where o means composition of functions.

h) If $A = \{1, 2\}$, $B = \{a, b, c\}$ then calculate $A \times B$. Is $A \times B = B \times A$? ($\times$ is Cartesian product)

i) What is a power set? Give an example and what is its cardinality?

j) Let $U = \{0, 1, 2, 3, 4, 5\}$. Represent $A = \{2, 4, 5\}$ with bit string.

SECTION-B

Q2) Prove by Induction that for all natural numbers n.

$$(n+1)^2 + (n+2)^2 + (n+3)^2 + \ldots + (2n)^2 = \frac{n(2n+1)(7n+1)}{6}$$

Q3) a) A bag contains 5 black and 6 red balls. Determine the number of ways in which 2 black and 3 red balls can be selected from the lot.

b) In how many ways can 5 children be arranged in a line such that two particular children of them are always together?

Q4) Solve the recurrence relation for Fibonacci numbers, $f_n = f_{n-1} + f_{n-2}$ given $f_1 = 1$, $f_2 = 1$.

Q5) What are the contrapositive, the converse and the inverse of the conditional statement “The home team wins whenever it is raining”?

Q6) Prove the following logical equivalence of distributive law $p \vee (q \wedge r) \equiv (p \vee q) \wedge (p \vee r)$.

Q7) Show that power set $P(S)$ has cardinality of 2^n.