BRAINWARE UNIVERSITY

Course – BSc(HN)

Discrete Mathematics (BHNC102)

(Semester – 1)

Time allotted: 3 Hours **Full Marks: 70**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group –A

1. Answer any TEN from the following questions: **1 x 10 = 10**

i. A _____ is an ordered collection of objects.
a) Relation
b) Function
c) Set
d) Proposition

ii. The set O of odd positive integers less than 10 can be expressed by _____.
a) {1, 2, 3}
b) {1, 3, 5, 7, 9}
c) {1, 2, 5, 9}
d) {1, 5, 7, 9, 11}

iii. In an undirected graph the the adjacency matrix is always symmetric
a) True
b) Odd

iv. The relation { (1,2), (1,3), (3,1), (1,1), (3,3), (3,2), (1,4), (4,2), (3,4)} is
a) Reflexive
b) Transitive
c) Symmetric
d) Asymmetric

v. In a graph if e=(u, v) means
a) u is adjacent to v but v is not adjacent to u
b) e begins at u and ends at v
c) u is processor and v is successor
d) both b and c

vi. If $A = \{1\}$ then power set of S is _____.
a) {{}}
b) $\{\emptyset, \{1\}\}$
c) $\{\emptyset\}$
d) None of these

vii. $(p \to q) \wedge p$ is equivalent to _____.
a) T
b) F
c)$q \wedge p$
d) q

viii. Solution of $a_n = 3a_{n-1}$ is
a) $a_n = 3$
b) $a_n = n$
c) $a_n = 2^n$
d) None of these

ix. The set of rational numbers is _____ .
a) Infinite
b) Finite
c) Subset
d) Empty

x. Multiplication of any three consecutive even integer is always even.
a) True
b) False

xi. Matrix multiplication is commutative.
a) True
b) False

Group – B

Answer any THREE from the following: **3 x 5 = 15**

2. Illustrate partition of a set.

3. Define bipartite and complete bipartite graphs.

4. What is equivalence relation? Give an example.

5. What is symmetric and skew symmetric matrix? Give an example.

6. Obtain the DNF of $P \wedge (Q \leftrightarrow R)$

Group – C

Answer any THREE from the following: **3 x 15 = 45**

7. a) Prove the following using mathematical induction:

   $n(n^2 + 5) is always divisible by 6$

   b) Prove that $[(p \to q) \wedge (q \to r)] \to (p \to r)$ is a tautology. 8+7=15

8. a) Prove that $A - (B \cup C) = (A - B) \cap (A - C)$

   b) If $A = \{1,2,3\}, B = \{3,4,5\} \wedge C = \{4,5,6\}$ then

      i) Prove that $(A \times B) - (A \times C) = A \times (B - C)$

      ii) Examine whether $(A \cap B) \times (B - A)$ is a subset of$(A \times B)$?

   c) Define complete graph with example. 5+8+2=15

9. a) Solve the following System of equation using matrix method:

   $4x - 3y + 2z = 11$
   $x + 2y + 4z = 16$
   $3x + 2y - z = 5$

   b) A small town has a total population 25000, out of which 13000 read 'The Statesman' and 10500 read 'The Hindustan Times' whereas 3500 read both papers. Find the percentage of population who read neither of these papers. 8+7=15

10. a) If $f(x) = 5x - 7$ then find$f^{-1}(x)$. Hence show that $f^{-1}of(x) = x$.

    b) Solve the following recurrence relation:

    $f(n) - 7f(n-1) + 12f(n-2) - n + 3 = 0$ 5+10=15