BRAINWARE UNIVERSITY

Course – BAMW

Discrete Structure (BMWC102)

(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

(Multiple Choice Type Questions)

10 x 1 = 10

1. *Choose the correct alternative from the following*

(i) 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}

(ii) A ________ is an ordered collection of objects.

a. Set b. Function
c. Relation d. Proposition

(iii) 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. Asymmetric d. Symmetric

(iv) If $A = \{1\}$ then power set of S is _________

a. $\{\{\}\}$ b. $\{\emptyset\}$
c. $\{\emptyset, \{1\}\}$ d. None of these

(v) The set of real numbers is __________

a. Infinite b. Subset
c. Finite d. Empty

(vi) $(p \rightarrow q) \vee p$ is equivalent to ________

a. T b. $q \vee p$
c. F d. q

(vii) If A is a non-null matrix then $(A^{-1})^{-1}$ is equals

a. A^{-2} b. A^{-1}

c. A d. None of these

(viii) Identity matrix is always a

a. Null matrix b. Square matrix

c. Triangular matrix d. None of these

(ix) An equivalence relation is transitive, reflexive and ______________

a. Antisymmetric b. Symmetric

c. Asymmetric d. None of these

(x) If n(A)=7, n(AUB)=15 and n(A∩B)=3 then n(B) equals

a. 21 b. 11

c. 25 d. 19

Group – B

(Short Answer Type Questions)

(Answer any *three* from the following)

3 x 5 = 15

2. Write a short note on bipartite graph. [5]
3. Describe partial ordered set. Give an example. [5]
4. Define Null Set, Singleton Set and Pairwise disjoint Set. [5]
5. Explain Symmetric and Skew-Symmetric matrix. [5]
6. Define Simple Graph and Multi Graph with an example. [5]

Group – C

(Long Answer Type Questions)

(Answer any *three* from the following)

3 x 15 = 45

7. (a) Prove that $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$ [5]

(b) Construct the truth table of $p \wedge (\sim q \vee r)$ [5]

(c) Express the following matrix as a sum of symmetric and skew symmetric matrix.

$$\begin{bmatrix} 4 & 0 & -3 \\ 3 & -1 & 5 \\ -2 & 5 & 2 \end{bmatrix}$$

[5]

8. (a) Prove the following using mathematical induction:

$n(n^2 + 5)$ *is always divisible by* 6 [7]

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

9. (a) Obtain the principal CNF of $\sim P \vee (Q \to R)$ [6]

(b) Prove that $(A \cup B)^c = A^c \cap B^c$ [5]

(c) If $A = \{1,2,3\}, B = \{3,4,5\} \wedge C = \{4,5,6\}$ then prove that
$(A \times B) - (A \times C) = A \times (B - C)$ [4]

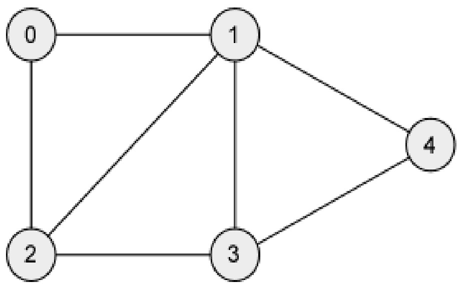
10. (a) There are 30 players in a group. 10 play soccer, 12 play tennis and 15 play golf. 3 players play both soccer and tennis. 5 players play both tennis and golf. 4 players play both soccer and golf. 2 play all three games. Find how many play only soccer, only tennis and only golf? Find how many play none? [8]

(b) Prove that the following mapping function $f: R \rightarrow R$is bijective.
$f(x) = 3x - 5$ [4]

(c) What is complete graph? Give an example. [3]

11. (a) Verify the following relation defined on set of straight line L is equivalence or not.
$R = \{(l_1, l_2): l_1 is\ parallel\ to\ l_2, l_1, l_2 \in L\}$ [6]

(b)



Find the degree of each vertex of the given undirected graph. Hence show that sum of degrees of the vertices is twice the number of edge. [7]

(c) Define regular graph. [2]