

B.SC. (I. T.) SEM. - I (2011 COURSE) : WINTER - 2017

SUBJECT: DISCRETE MATHEMETICS

Day: **Monday**
Date: **18/12/2017**

Time: **10.00 AM TO 01.00 PM**
Max. Marks: 80

W-2017-0862

N.B.:

- 1) Attempt **ANY FIVE** full questions.
- 2) Figures to the right indicate **FULL** marks.

Q.1 a) Define the following terms with appropriate examples:- (06)
i) Set; ii) Subset; iii) Power set; iv) Partition

- b)** Among the integers 1 to 1000 (10)
i) How many are neither divisible by 3 nor by 5 nor by 7?
ii) How many of them are not divisible by 5 or 7 but are divisible by 3?

Q.2 a) Prove that $(A \cup B) \cup C = A \cup (B \cup C)$. (06)

- b)** Find the number of ways in which 5 IT students and 6 AG students can be seated at a round table so that no two IT students are seated together. (10)

Q.3 a) Let R be the following relation on $A = \{1, 2, 3, 4\}$ (08)

$$R = \{(1, 3), (1, 4), (3, 2)\}$$

- i) Find M_R
- ii) Find domain and Range of R;
- iii) Find R^{-1} ,
- iv) Draw the directed graph of R.

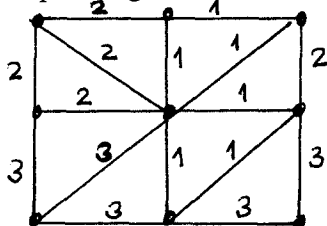
- b)** Out of 140 student, 60 have taken math, 45 science and 20 both. Find the number of student who have taken (08)
i) At least one subject; ii) Neither math nor science.

Q.4 a) Prove the following using mathematical induction:- (08)

$$1^2 + 2^2 + 3^2 + \dots + n^2 = n(n+1)(2n+1)/6$$

- b)** Prove that $\sqrt{2}$ is not rational. (08)

Q.5 Find a minimal spanning tree for the weighted graph shown:- (10)



- b)** For the graph G defined by $V(G) = \{V_1, V_2, V_3, V_4\}$ and $E(G) = \{(V_1, V_2), (V_2, V_3), (V_3, V_4), (V_4, V_1), (V_2, V_4)\}$. Find the adjacency and incidence matrices. (06)

Q.6 a) A binary tree T produces the pre-order traversal sequence F- A- K- C- D- H- G- B- E and the in-order traversal sequence A- C- K- F- H- D- B- G- E. Draw the tree and find its depth. (08)

- b)** Determine whether or not each is (08)
i) Reflexive; ii) Symmetric; iii) Transitive

Construct a binary search tree for the following eleven data element:-
19, 37, 07, 10, 40, 39, 21, 04, 01, 69, 03.