



Date: 5/6/2012

Time: 3 hours

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Final Exam. 2011-2012

First trail

Subject: Discrete Mathematics

Class: first

Branch : Sw, Net, & Scu.

**Note: Answer (6) questions only , 10 marks for each.**

**Q1)** Prove by induction (for  $n = 1$ ) :  $1 + 4 + 7 + \dots + (3n - 2) = \frac{1}{2} n (3n - 1)$

**Q2)** for the following relations on the set  $A = \{1, 2, 3\}$ :

$R = \{(1, 1), (1, 2), (1, 3), (3, 3)\}$ , &  $Q = A \times A =$  the universal relation

Determine if  $R$  &  $Q$  is:

(a) reflexive; (b) symmetric; (c) transitive; (d) antisymmetric.

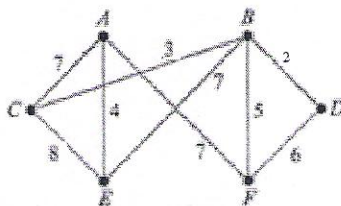
**Q3)** Sketch the graph of the  $g: \mathbb{R} \rightarrow \mathbb{R}$  where  $g(x) = x^3 + 5$

Is  $g(x)$  : 1) Function?

2) One-to-one?

3) Onto? (Mention the reasons)

**Q4)** Find minimum spanning tree and its weight for the following graph using Kruskal algorithm



**Q5)** In a survey of 100 students produced the following:

32 study mathematics

20 study physics

45 study biology

15 study mathematics & biology

7 study mathematics & physics

10 study physics & biology

30 do not study any of the three subjects

(a) Find the number of students studying all three subjects?

(b) Fill in the correct number of students in each of the eight regions of the Venn diagram.

**Q6)** Consider the algebraic expression:  $(6 - (2 + (6/3))) * ((5 - 2) + 1)$

1- Rewrite the expression into prefix polish notation form

2- Draw the corresponding ORT

3- Evaluate the value of the expression in prefix polish notation form

**Q7)** design a finite state machine that recognizes the sequence pattern "ab" in the input string  $x \in A^*$ .

Where the input  $A = \{a, b\}$ , and the output  $Z = \{0, 1\}$ .

Trace the input string  $x \in A^*$  :  $X = a a b b a b a b$