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# Foundation of Computer Science

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(ICS-251)

Semester 971

# Major Examination I

**Max. Time allowed: 01:15 Hours**

Name: \_\_\_\_\_

I.D. No.: \_\_\_\_\_

Question	Full Marks	Score
1	3	
2	6	
3	3	
4	5	
5	3	
6	5	
7	4	
8	6	
<b>Total</b>	<b>35</b>	

**Question 1 [3 Marks]**

Let  $A = \{1\}$ ,  $B = \{1, a, 2, b, c\}$ ,  $C = \{b, c\}$ ,  $D = \{a, b\}$ , and  $E = \{1, a, 2, b, c, d\}$ . Fill the following statements with  $\subseteq$  or  $\not\subseteq$  to give a true statement.

- (a)  $A$        $B$ ,      (b)  $\emptyset$        $A$ ,      (c)  $B$        $C$ ,  
 (d)  $C$        $E$ ,      (e)  $D$        $C$ ,      (f)  $B$        $E$ .

**Question 2 [3 + 3 Marks]**

In a survey of 260 college students, the following data were obtained:

- 64 had taken a Mathematics course,
- 94 had taken a Computer Science course,
- 58 had taken a Business course,
- 28 had taken both Mathematics and Business course,
- 26 had taken both Mathematics and Computer Science course,
- 22 had taken both Computer Science and Business course,
- 14 had taken all three types of courses,

- (a) How many students were surveyed who had taken none of the three types of courses?  
 (b) Of the students surveyed, how many had taken only a Computer Science course?

**Question 3 [3 Marks]**

Draw a Venn diagram that represents the following relationships:

$$B \subseteq A,$$

$$C \not\subseteq A,$$

$$C \cap B \neq \phi,$$

$$x \in A \cap B \cap C$$

$$y \in A \cap \bar{B} \cap \bar{C}.$$

**Question 4 [5 Marks]**

Define the followings and give one example in each case:

1. Universal Quantification:

2. Existential Quantification:

3. Tautology:

4. Absurdity (Contradiction):

5. Contingency:

**Question 5 [3 Marks]**

Use the following statement:  $s$ : If  $2 + 4 = 6$ , then I am taking ICS 251.

1. State the contrapositive of  $s$

2. Write the converse of  $s$ .

3. Write the negation of  $s$ .

**Question 6 [4 + 1 Marks]**

- (a) Find the GCD and the LCM for the integers: 300 and 5103

- (b) Using some relationship between GCD and LCM, confirm that your answers in (a) are correct.

**Question 7 [4 Marks]**

Without using the truth table, show that the following is a tautology:

$$((p \rightarrow q) \wedge \sim q) \rightarrow \sim p.$$

**Question 8 [6 Marks]**

Use *Mathematical Induction* to prove the following:

$$1 + 2^{2n} < 5^n, \text{ for all } n \geq 2$$