

Question 1. [6 MARKS]**Part (a)** [1 MARK]

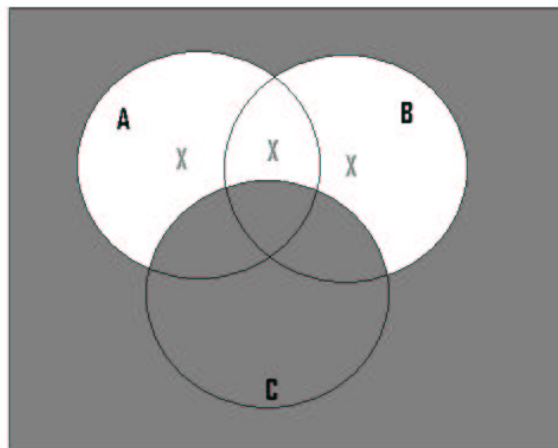
C is true.

Part (b) [1 MARK]

Nothing.

Part (c) [2 MARKS]

If not C, then not A and not B.

Part (d) [2 MARKS]**Question 2.** [8 MARKS]**Part (a)** [2 MARKS] $\neg \exists x \in C, P(x, CSC108)$

or

 $\forall x \in C, \neg P(x, CSC108)$ **Part (b)** [2 MARKS] $\forall y \in C, \exists x \in C, P(x, y)$ **Part (c)** [2 MARKS] $\exists x \in C, \forall y \in C, \neg P(x, y)$ **Part (d)** [2 MARKS] $\neg \exists x \in C, P(x, x)$

or

 $\forall x \in C, \neg P(x, x)$

Question 3. [3 MARKS]

Note: we added `else return false;` to the end during the test.

```
return A && !B && ((C && (C || !D)) || !C);
```

or

```
return A && !B;
```

Question 4. [8 MARKS]**Part (a)** [2 MARKS]
$$\forall i \in \mathbb{N}, \exists j \in \mathbb{N}, a_j > i \wedge j \leq i$$
Part (b) [4 MARKS]

True. For example, $i = 8$.

False.

Part (c) [2 MARKS]

Let $i = _$.

$_ \rightarrow$, so $i \in \mathbb{N}$.

Let $j \in \mathbb{N}$.

Suppose $a_j > i$.

—

Then $j > i$.

So $a_j > i \rightarrow j > i$.

Since j is an arbitrary element of \mathbb{N} :

$$\forall j \in \mathbb{N}, a_j > i \rightarrow j > i.$$

Since $i \in \mathbb{N}$, and $\forall j \in \mathbb{N}, a_j > i \rightarrow j > i$:

$$\exists i \in \mathbb{N}, \forall j \in \mathbb{N}, a_j > i \rightarrow j > i.$$

Total Marks = 25