3(i) Nobody is perfect is the opposite of: (2)

Everybody is perfect

$\forall x\, P(x)$. where $P(x)$ – x is perfect ($\frac{1}{2}$ mk)

Not (everybody) is perfect $\equiv \sim \forall x\, P(x)$ ($\frac{1}{2}$ mk)

$\Rightarrow \exists x \sim P(x)$.

Nobody is perfect $\equiv \sim \forall x\, P(x)$

OR $\exists x \sim P(x)$.

ii) At least one FUO student is a genius.

Let $P(x)$ rep. x is a FUO student ($\frac{1}{2}$ mk)

Let $Q(x)$ rep. x is a genius ($\frac{1}{2}$ mk)

$\exists x\, P(x) \rightarrow Q(x)$. (1 mk)

$\exists$ => There is a student who is a FUO student, (i.e one student, not all student).

4) i. $\{x \in N : x^2 < 45\} = \{0, 1, 2, 3, 4, 5, 6\}$ ($1\frac{1}{2}$ mk)

ii. $\{x \in Z : x^2 < 45\} = \{-6, -5, -4 \cdots, 0, 1, 2, 3, 4, 5, 6\}$ ($1\frac{1}{2}$ mk)

iii. $\{x \in R : x^2 + 2x = 0\} = \{0\}$. ($1\frac{1}{2}$ mk).

5. i $P(T) = 4$ (1 mk)

ii $S \times V = \{1,2,3\} \times \{a,b\}$ (1 mk)

$= \{(1,a), (1,b), (2,a), (2,b), (3,a), (3,b)\}$

iii $S - T = \{(1,2)\}$ (1 mk)

(iv) $\overline{S} = \{4, a, b\}$ (1 mk)