CS3SD3 - Assignment 3

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Question 7

(a) (i) $\neg p \Rightarrow r \equiv \neg(\neg p) \vee r) \equiv p \vee r$. Since we have $L(s_0) = \{r\}$, $M, s_0 \vDash \varphi$. We have $L(s_2) = \{p, q\}$, so $M, s_2 \vDash \varphi$

(ii) Since $r \in L(s_0)$, $r \in L(s_1)$, and we can have path $s_0 \to s_1 \to s_1 \to s_1 \to \ldots$, we know that $M, s_0 \vDash \text{EG } r$. Therefore, $M, s_0 \vDash \neg\text{EG } r$ is false. Since $r \notin L(s_2)$, we know that $M, s_0 \vDash \neg\text{EG } r$ is true as future also includes present.

(iii) Since $t \notin L(s_0)$, we know that $M, s_0 \vDash \text{E}(t \text{ U } q)$ is false. Since $q \in L(s_2)$, we know that q already holds in s_2, thus, we don't need t to hold anymore. Therefore, $M, s_2 \vDash \text{E}(t \text{ U } q)$ is true.

(iv) Since $q \in L(s_2)$, and we have a path $s_0 \to s_2 \to \ldots$, we know $M, s_0 \vDash \text{F } q$ is true. Since $q \in L(s_2)$, we also know $M, s_2 \vDash \text{F } q$ is true since future also includes present.