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Draft papers:

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The test consists of **2 questions**. The available time to solve the quiz is **20 minutes**. Please use a blue coloured pen; the use of any other tools is forbidden.

	a	b	c	d	e	f	g
1.)	☐	☐	☐	☐	☐	☐	☐
2.)	☐	☐	☐	☐	☐	☐	☐

Please copy the multiple choice questions' solution in the attached table. For each correct answer marked, 2 points are awarded; for each incorrect answer marked, -1 point is awarded. There is no limit to the number of correct answers per question. A negative aggregate score will be interpreted as 0 points.

1.) Let $L^{(1)} = \langle LC, Var, (\mathcal{P}(1) \cup \mathcal{P}(2) \cup \mathcal{F}(0) \cup \mathcal{F}(2)), Term, Form \rangle$ be a first-order language so that

$$Var = \{\, y_i \,|\, i \in \mathbb{N} \,\}, \quad \mathcal{P}(1) = \{\, Q \,\}, \quad \mathcal{P}(2) = \{\, R \,\}, \quad \mathcal{F}(0) = \{\, a \,\}, \quad \mathcal{F}(2) = \{\, g \,\}.$$

Which string of symbols are terms or formulas of the language $L^{(1)}$. Select the correct statements.

-1   A term of the language $L^{(1)}$ is: $R(y_1, y_2)$

2   A term of the language $L^{(1)}$ is: $g(y_1, y_2)$

-1   A term of the language $L^{(1)}$ is: $g(y_3, c)$

2   A formula of the language $L^{(1)}$ is: $(Q(y_1) \equiv Q(y_2))$

-1   A formula of the language $L^{(1)}$ is: $\forall y_1 \neg (Q(y_1) = a)$

2   A formula of the language $L^{(1)}$ is: $\neg R(a, a)$

2   A formula of the language $L^{(1)}$ is: $\neg \exists y_1 R(y_1, a)$

2.) Let $L^{(1)}$ be a first-order language defined as follows:

$$L^{(1)} = \langle LC, \{x_1, x_2, \ldots\}, \{P, Q, c\}, Term, Form \rangle$$
$$P \in \mathcal{P}(1), \qquad Q \in \mathcal{P}(2), \qquad c \in \mathcal{F}(0).$$

Let $\langle U, \varrho \rangle$ az $L^{(1)}$ be an interpretation of the language, so that:

- $U = \{u_1, u_2, u_3\}$

- $\varrho(P) = P' \qquad P'(x) = \begin{cases} 1 & \text{if } x = u_1 \\ 0 & \text{otherwise} \end{cases}$

- $\varrho(Q) = Q' \qquad Q'(x,y) = \begin{cases} 1 & \text{if } x = u_1 \text{ és } y = u_1 \\ 0 & \text{otherwise} \end{cases}$

- $\varrho(c) = u_2$

Let v be an assignment relying on the interpretation, so that $v : Var \to U$ and

$$v(x_1) = u_3, \qquad v(x_2) = u_1$$

Which of the formulas below are true?

$\boxed{-1}$ $\quad |(Q(c,c) \equiv P(x_2))|_v^{\langle U, \varrho \rangle}$

$\boxed{2}$ $\quad |\neg P(x_1)|_v^{\langle U, \varrho \rangle}$

$\boxed{2}$ $\quad |(Q(c,c) \equiv P(x_1))|_v^{\langle U, \varrho \rangle}$

$\boxed{-1}$ $\quad |(\neg P(x_1) \wedge P(c))|_v^{\langle U, \varrho \rangle}$

$\boxed{2}$ $\quad |(Q(x_1, x_2) \supset P(x_1))|_v^{\langle U, \varrho \rangle}$

$\boxed{2}$ $\quad |((x_1 = x_2) \supset (x_2 = c))|_v^{\langle U, \varrho \rangle}$

$\boxed{-1}$ $\quad |(P(x_2) \supset Q(x_1, x_2))|_v^{\langle U, \varrho \rangle}$