Name: _____

Entry number: _____

There are 2 questions for a total of 10 points.

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1. (4 points) Answer the following questions on Predicate Logic.

   (a) Consider the following predicates:

   1. $H(x)$: x works hard.
   2. $E(x, y)$: x is enrolled in course y.
   3. $A(x, y)$: x gets an A grade in course y.
   4. $L(x, y)$: x has been late in course y.

   Express each of the statements below using quantifiers and the predicates given above. The domain of the variable x is the set of all students in ACOL1002, and the domain of the variable y is the set of all courses taught at IIT Delhi - Abu Dhabi during Semester-II-2025–26.

	Statement	**Quantified expression**
S_1	Everyone who gets an A in some course, works hard or has not been late in any course.	
S_2	Everyone who gets an A in some course is enrolled in that course.	
S_3	No one has been late in any course.	
S_4	Everyone who has been late in some course does not work hard.	

2. (6 points) Determine whether this argument about a hypothetical AI system named *Jarvis* is valid.

> *If Jarvis were able and authorized to stop misinformation, it would do so. If Jarvis were unable to stop misinformation, it would be defective. If Jarvis were unauthorized to stop misinformation, it would be restricted. Jarvis does not stop the misinformation. If Jarvis exists, it is neither defective nor restricted. Therefore, Jarvis does not exist.*

Give your reasoning by first writing the premises and conclusion using the following propositional variables, and then check whether the argument form is valid.

A:	Jarvis is able to stop misinformation	D:	Jarvis is defective
U:	Jarvis is authorized to stop misinformation	R:	Jarvis is restricted
S:	Jarvis stops misinformation	E:	Jarvis exists

Express the premise and conclusion in terms of the above propositional variables.

Statement	**Logical expression**
If Jarvis were able and authorized to stop misinformation, it would do so.	
If Jarvis were unable to stop misinformation, it would be defective.	
If Jarvis were unauthorized to stop misinformation, it would be restricted.	
Jarvis does not stop the misinformation.	
If Jarvis exists, it is neither defective nor restricted.	
Therefore, Jarvis does not exist.	

Determine whether the argument form in the right column of the above table (that you filled out) is valid. Show steps.