1 Question 1: 5 Points Use all the premises and apply rules of inference to show that the premises (comma separated): (p ∧t) → (r ∨s), q →(u ∧t), u →p, ¬s, q lead to conclusion r 2 Question 2: 4 + 3 + 4 + 5 Points Answer the questions with justification whenever needed. (a) Suppose, four of you are acting as the members of a committee formed by your university. You have right to vote in favor or in against any law. Provide a logical expression that ensures that any two of you vote against a law and the other two vote in favor of the law. (b) Quantify if the below statements are True or False. Show your justification using an example or counter example: i) ∀p∃q(pq = 1), p ∈R+, q ∈N ii) ∃p(p8 < p4), x ∈R− iii) ∀p(8p ≥2p), p ∈Z (c) Use series of logical equivalences to check if ¬[(x ∨y) ∧¬x →¬y] is logically equivalent to ¬x ∧y (d) Suppose, you are asked to show if the rule hypothetical syllogism is valid or invalid. Show the relevant works.

1 Question 1: 5 Points

Use all the premises and apply rules of inference to show that the premises (comma separated): (p ∧t) →

(r ∨s), q →(u ∧t), u →p, ¬s, q lead to conclusion r

2 Question 2: 4 + 3 + 4 + 5 Points

Answer the questions with justification whenever needed.

(a) Suppose, four of you are acting as the members of a committee formed by your university. You have

right to vote in favor or in against any law. Provide a logical expression that ensures that any two of

you vote against a law and the other two vote in favor of the law.

(b) Quantify if the below statements are True or False. Show your justification using an example or counter

example:

i) ∀p∃q(pq = 1), p ∈R+, q ∈N

ii) ∃p(p8 < p4), x ∈R−

iii) ∀p(8p ≥2p), p ∈Z

(c) Use series of logical equivalences to check if ¬[(x ∨y) ∧¬x →¬y] is logically equivalent to ¬x ∧y

(d) Suppose, you are asked to show if the rule hypothetical syllogism is valid or invalid. Show the relevant

works.