Intro to AI Exam 2013­2014

1. a) A(0) / \ B(3) C(7) / / \ C(5) D(13) E(11) / \ | D(11) E(9) D(16)

| D(14)

b) Say h(Node1, Node2) is our heuristic h(Node1, Node2) = d(Node1, Node2) / Vavg

In order for h to be heuristic then h needs to be admissible. h(Node1, Node2) <= Cost of the arc between Node1 and Node2 = distance of the road between Node1 and Node2 / Vmax Assume that d(Node1, Node2) is equal to the distance of the road ( ie the road is as the crow flies) => d(Node1, Node2) = distance of the road and Vavg < Vmax =>

d(Node1, Node2) / Vavg > distance of the road / Vmax => contradiction

A better heuristic would be h(Node1, Node2) = d(Node1, Node2) / Vmax ( where Vmax is the max speed and d is the distance as the crow flie). This is better because d(Node1,Node) will always be less or equal to the distance of the road.

c) This is a frame axiom formula. It’s purpose is to say that nothing happens to the colour of x when you move x to z. For example in the Block World, if a block x had colour y, this would not change if block x was moved on top of colour z.

2. a) i) exam\_style

​ / \

lecturer lecturer /a |b \c /a |b \c yes no yes loc no yes

/\l oncampus / \offcampus

yes no

a. ii)

For a depth of 1, we would need an attribute, such that for the same value of the attribute, we have the same select. This is not present in the table.

For depth 2, if we can use Time and Location to represent a decision tree of depth 2.(The only conflict for time is at 9:00 am, where we can resolve the decision by the Location attribute).

This means that the minimum depth is depth 2. Therefore, our decision tree in the previous point is not of minimum depth.

iii) select(x) <­ exam\_style(x, 2/2), lecturer(x,a)

select(x) <­ exam\_style(x, 2/2), lecturer(x,c) select(x) <­ exam\_style(x, 3⁄4) , lecturer(x,c) select(x) <­ exam\_style(x, 3⁄4) , lecturer(x,a) , location(x, oncampus)

b) i) exam\_style(x, 2/2 )

<­ select(x)

| using select(x) <­ exam\_style(x,2/2) , lecturer(x,a) <­ lecturer(x,a)

| FAILED

| backtrack <­ select(x)

| using select(x) <­ exam\_style(x,2/2) , lecturer(x,c) <­ lecturer(x,c)

| FAILED

| nothing to backtrack to FAILED

=> we don’t know if the course is to be taken, we don’t have enough information

ii) exam\_style(x, 3/4) location(x, oncampus) lecturer(x, a) time(x, 9:00)

<­select(x)

| using select(x) <­ exam\_style(x, 3⁄4) , lecturer(x,a) , location(x, oncampus) <­ exam\_style(x, 3⁄4) , lecturer(x,a) , location(x, oncampus)

| using the given facts BOX with {}

=> the course is to be taken

c) i) select(x) <­ lecturer(x,a ) , not abn\_course(x) abn\_course(x) <­ time(x, 9:00), not location(x, oncampus)

ii) lecturer(x, a) location(x, oncampus) time(x, 9:00)

<­select(x) | using select(x) <­ lecturer(x,a ) , not abn\_course(x) <­ lecturer(x,a ) , not abn\_course(x) | using lecturer(x,a) <­ not abn\_course(x) ­­­­­subcomputation­­­­­> <­ abn\_course(x)

| ​

using abn\_course(x) <­ time(x, 9:00), not location(x, oncampus) <­ time(x, 9:00) , not location(x, oncampus)

| using time(x,9:00) & location(x,oncampus

​ //expand here on not location FAIL | using the subcomputation and NAF BOX with {}

=> We would select such a course.