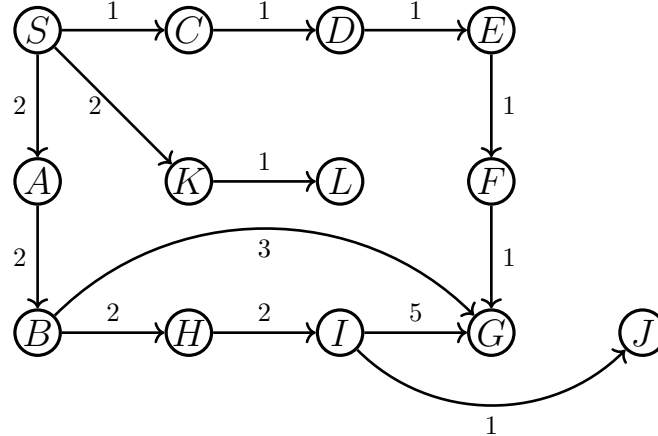


COMP 4475 Assignment One

Due: February 8th, Before Class (11AM)

1. (30 marks) Consider the graph in the following



The heuristic estimate of the distance to G are:

$$h(A, 2), h(B, 3), h(C, 4), h(D, 3), h(E, 2), h(F, 1), h(G, 0)$$

$$h(H, 4), h(I, 5), h(J, 6), h(K, 5), h(L, 6), h(S, 4).$$

(4 marks) Draw the corresponding search tree for the graph. The tree is rooted at S , and the goal node is G .

Find a path from S to G using each of the following search strategies, from (a) to (e). For each one of the strategies, report whether the returned solution path is an optimal one. Give your explanation and remarks on “why-optimal” or “why-non-optimal”. For A* search in particular, your discussion will have to check with the admissibility properties of the heuristics.

- (4 marks) depth-first search
 - (4 marks) breadth-first search
 - (4 marks) least-cost first search
 - (4 marks) best-first search
 - (10 marks) A* search
2. (15 marks) Consider the language that contains the predicates of symbols *degree*, *student*, *pass*, *test*, *goodscore*, and *subscribe*, all of arity 0. Given the following knowledge base built from this language:

$degree \leftarrow student \wedge pass.$
 $pass \leftarrow test \wedge goodscore.$
 $test \leftarrow subscribe.$
 $student.$
 $subscribe.$

- (5 marks) How many interpretations exist for this propositional language?
- (5 marks) Consider the following interpretations:

	$\pi(student)$	$\pi(subscribe)$	$\pi(test)$	$\pi(goodscore)$	$\pi(pass)$	$\pi(degree)$
I_1	F	T	T	F	F	F
I_2	T	T	F	T	F	T
I_3	T	T	T	T	F	F
I_4	T	T	T	T	T	T
I_5	T	T	T	F	F	F

Which interpretations are models of the knowledge-base? Which are not? Why (not)?

(c) (**5 marks**) Give all logical consequences of the knowledge-base.

3. (**15 marks**) Which of the following are correct?

- (a) $A \equiv B \models (A \vee B)$.
- (b) $(A \equiv B) \models \neg A \vee B$.
- (c) $(A \wedge B) \rightarrow C \models (A \rightarrow C) \vee (B \rightarrow C)$.
- (d) $(A \vee B) \wedge (\neg C \vee \neg D \vee E) \models (A \vee B) \wedge (\neg D \vee E)$.
- (e) $(A \equiv B) \wedge (\neg A \vee B)$ is satisfiable.