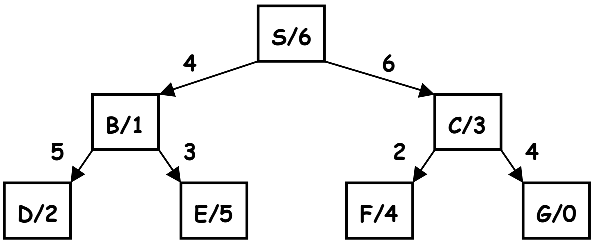
Course:	**010595001 - ARTIFICIAL INTELLIGENCE**		
Lecturer:	Jan VORACEK	Examination date:	18.11.2000
Notes:	a) *student can use a general mathematical handbook, English dictionary and a calculator* b) *type, please, your answers in English*		

Example 1: **Searching** *(10 pts.)*

Suppose that you need to find a path between *S* and *G* in the following graph:



The number attached to each edge represents the cost of traversing the edge, the number inside the node represents the estimated distance to the goal. For each of the below given methods list the nodes in order in which they are expanded by a particular search method, for example*: DFS: [S,B,D,E,C,F,G]*.

a) iterative deepening search *(IDS)*
b) uniform cost search *(UCS)*
c) greedy search *(GS)*
d) A*
e) hill climbing *(HC)*

Example 2: **First order logic** *(10 pts.)*

Consider the following set of axioms:

```
1. forall x [equal(x,x)]
2. forall y,z [equal(y,z) -> equal(z,y)]
3. forall w,s,t [equal(w,s) and equal (s,t) -> equal(w,t)]
4. equal(b,a)
5. equal(b,c)
```

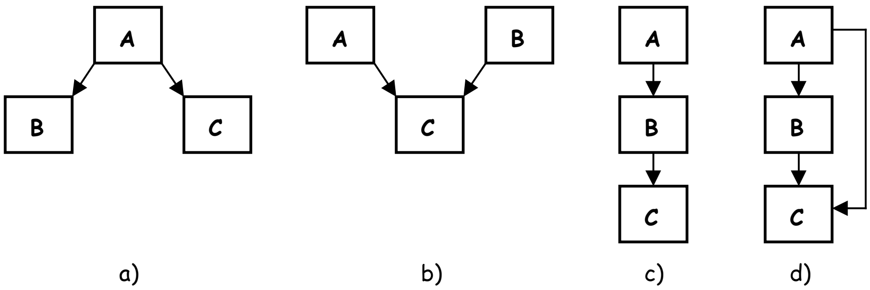
and the conclusion:

- `equal(c,a)`

As usually, *a,b, c* denote constants and *x,y,z,w,s,t* variables. Prove the conclusion from the axioms by refutation using resolution.

Example 3: **Bayes networks** *(10 pts.)*

Match the following probabilistic networks:



with the below given statements. If there are multiple matchings, list them as well. Note that not all statements must be matched.

```
I)    P(C|A,B) = P(C|A)
II)   P(C|A,B) = P(C|B)
III)  P(B|A) = P(B)
IV)   P(B,C|A) = P(B|A) P(C|A)
```

Example 4: **Learning** *(10 pts.)*

The following table contains training data that helps a cleaning robot in the new tieto-sähkötalo to predict whether or not an office contains a recycling bin. Use information theory (e.g. ID3 algorithm) and construct the corresponding minimal decision tree.

	STATUS	DEPT.	OFFICE SIZE	RECYCLING BIN
1.	faculty	säte	large	no
2.	staff	säte	small	no
3.	faculty	tite	medium	yes
4.	student	säte	large	yes
5.	staff	tite	medium	no
6.	faculty	tite	large	yes