Mid-term Exam Model answer
Question1

A) Consider the following statements: **(4 marks)**

1. "Samir likes easy courses."
2. "Mathematics courses are hard."
3. "All the courses in the Sports Department are easy."
4. "SS301 is a sports course."

Using the following predicates:
Likes(x, y): x likes y.
EasyCourse(x): x is an easy course.
SportDeptCourse(x): x is a course in the Sports Department.

i. Write the above statements in predicate logic. **(each=1/2)**

- $\forall x$ (EasyCourse (x) → Likes(Samir, x))
- $\forall x$ (MathCourse(x) → ¬ EasyCourse(x))
- $\forall x$ (SportDeptCourse(x) → EasyCourse(x))
- SportDeptCourse(SS301)

ii. Using resolution, answer the question "What course would Samir like?

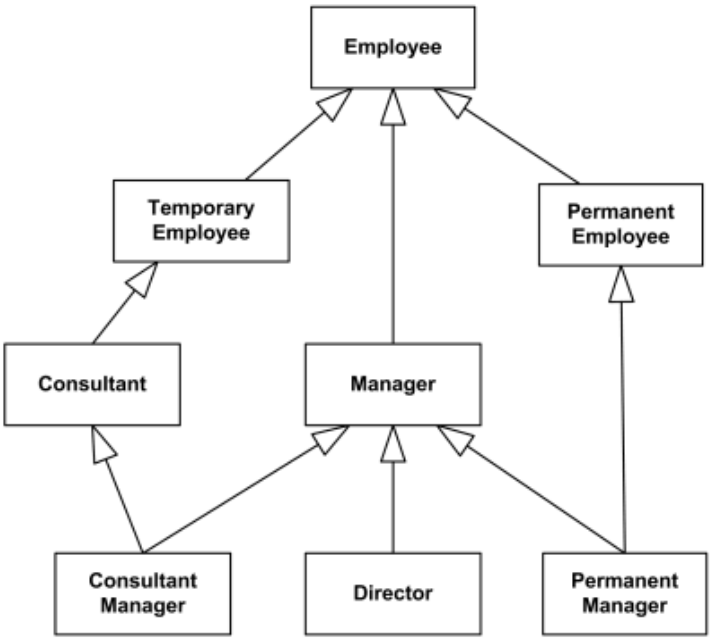
First **step (1 mark**) to transform the above sentences to CNF:
1: Likes(Samir, x) ∨ ¬ EasyCourse (x)
2: ¬ MathCourse(x) ∨ ¬ EasyCourse(x)
3: ¬ SportDeptCourse(x) ∨ EasyCourse(x)
4: SportDeptCourse(SS301)

Second Step (1 mark) to do the resolution :
3 + 4 = 5 : EasyCourse(SS301)
1 + 5 = 6 : Likes(Samir, SS301)

B) Determine whether (¬ Q ∧ (P → Q)) → ¬ P is a tautology (do NOT use truth tables**) (1 mark)**

Answer:
(¬ Q ∧ (P → Q)) → ¬ P ≡ ¬ (¬ Q ∧ (¬ P ∨ Q)) ∨ ¬ P ≡ (Q ∨ (P ∧ ¬ Q)) ∨ ¬ P ≡
((Q ∨ P) ∧ (Q ∨ ¬ Q)) ∨ ¬ P ≡ ((Q ∨ P) ∧ **T**) ∨ ¬ P ≡ (Q ∨ P) ∨ ¬ P ≡ Q ∨ (P ∨ ¬ P) ≡ Q ∨ **T** ≡ **T**
Tautology

Question2 **[3 Marks]**

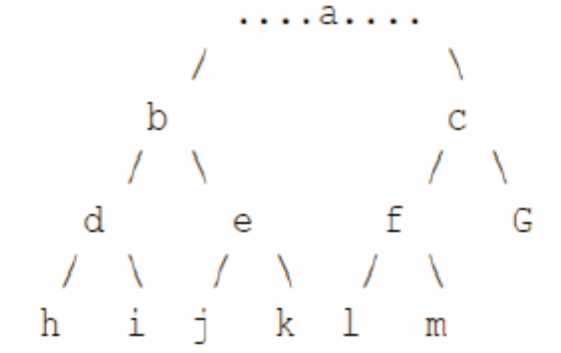


Mohamed Ahmed Aly

class precedence list for Mohamed	Consultant manager-consultant-temporary employee-manager-employee
class precedence list for Aly	Permanent manager- manager- permanent employee-employee
Mohamed' year vacation	10
Aly' year vacation	25

Question3 [**4Marks]**

A) In the search tree below, A is the start node and G a goal node **[2marks]**



(1) List the nodes created by the breadth-first algorithm in their order of creation.

exp. node	**OPEN list**	**CLOSED list (1 mark)**
	{ a }	**{}**
a	**{ B C }**	**{a}**
B	**{ C D E }**	**{A B}**
C	{ D E F G }	{ A B C}
D	{ E F G H I}	{ A B C D}
E	{ F G H I J K }	{ A B C D E}
F	{ G H I J K }	{ A B C D E F}
G	{H I J K }	{ A B C D E F G}

(2) List the nodes created by iterative deeping algorithm in their order of creation**.(1 mark)**

Iteration1 a
Iteration2 a b c
Iteration1 a b d e c f g

(3) Compare between the numbers of visited nodes when applying each of the above methods
Breadth = 7 nodes, Iterative = 11 node

B) Compare between the following knowledge representation methods **[2marks]**

KR scheme	**Frame**	**Semantic Networks**	**grade**
Knowledge representation elements (Syntax)	1-frame 2-slot 3-slot value	1-node 2-arc	1
Inference Mechanism	1- inheritanc e 2- multiple inheritance	1- inheritance 2- Intersection search	1