EXAMEN SESSION PRINCIPALE

A.U:	2021/2022	Cycle:	Engineering
Module :	Formal_Logic	**Level:**	1st Year
Time :	--	**Field**	Informatique
Date	--	**Duration:**	2h
Documents :	Not Authorized	**N° pages:**	2

Exercise	1(6pts)	2(4pts)	3(6pts)
C.L.Os Assessement	K1, S1, V1, V4	K1, S1, V1, V4	K1, S1, V1

Exercise1 (6pts)

Suppose the dogs bark and the caravan passes. Translate the following propositions into propositional language.

1- If the caravan passes, then the dogs bark.
2- Dogs don't bark.
3- The caravan does not pass or the dogs bark.
4- The dogs do not bark and the caravan does not pass.

Exercise2 : (6pts)

Translate the following statements into predicate logic formulas

1- John is taller than Mary.
2- Paul saw Léa and she did not see him.
3- Not all men love Mary.
4- There is a song that no child sings.
5- If all men love Mary, then she is happy.
6- Some farmers appreciate a minister.

Exercise 3 (8pts)

A - Give a prenex form of the following formulas, specifying the calculation steps:

1. $\exists x p(x) \Rightarrow \forall x p(x)$
2. $\exists x \forall y (\exists z P(x, y, z) \wedge Q(x, y)) \Rightarrow \exists y (\forall x P(x, z, y) \wedge \exists x Q(y, x))$

B - Put in prenex form then skolemize the formulas:

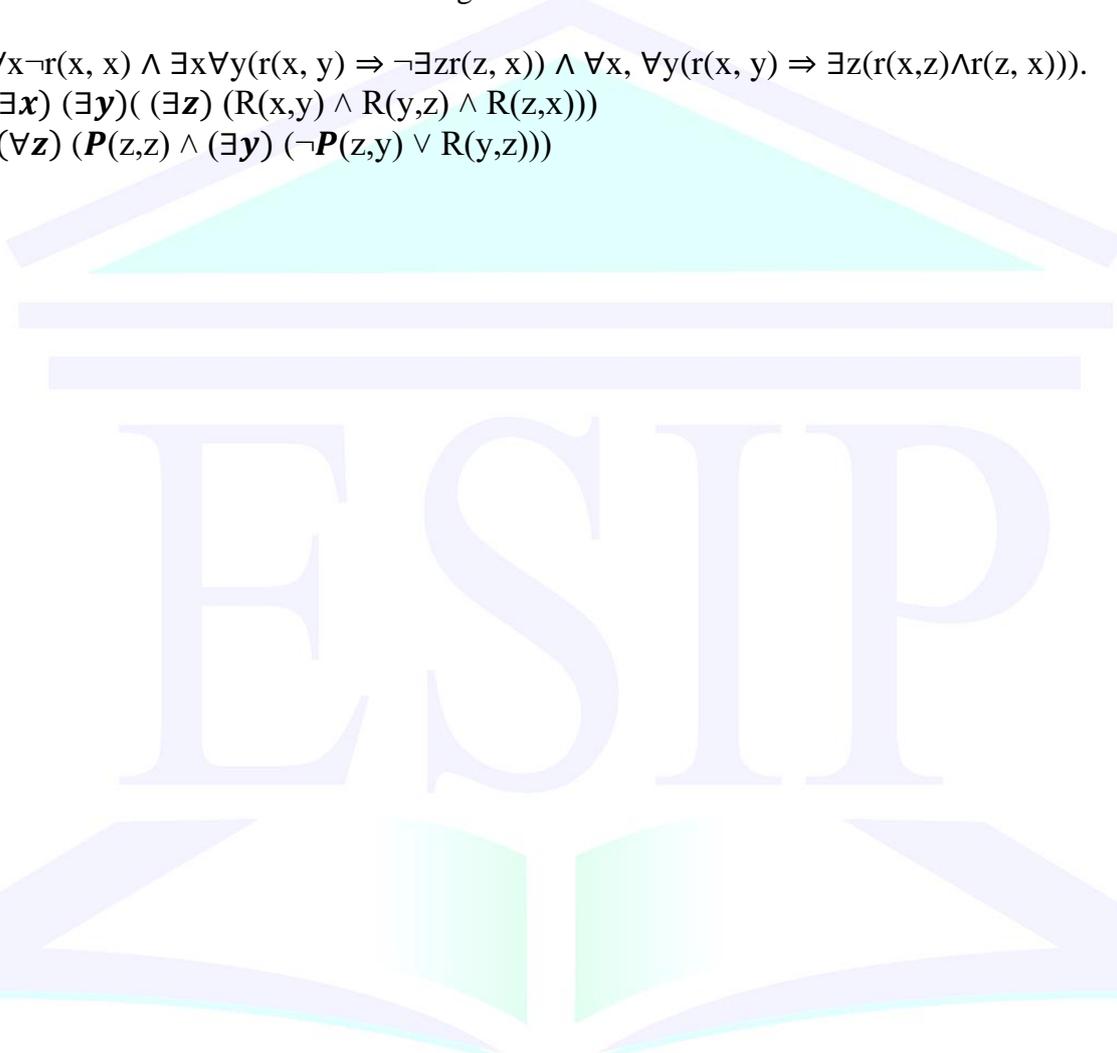1. $\neg(\neg\phi(x) \lor \forall x\psi(x)) \land (\exists x\phi(x) \Rightarrow \forall x\tau(x))$
2. $(\exists x\forall y(\exists z P(x, y, z) \land Q(x, y))) \Rightarrow (\exists y(\forall x P(x, z, y) \land \exists x Q(y, x)))$

C – Give a clausal form of the following formulas:

1. $\forall x \neg r(x, x) \land \exists x\forall y(r(x, y) \Rightarrow \neg\exists z r(z, x)) \land \forall x, \forall y(r(x, y) \Rightarrow \exists z(r(x,z) \land r(z, x)))$.
2. $(\exists x)(\exists y)((\exists z)(R(x,y) \land R(y,z) \land R(z,x)))$
3. $(\forall z)(P(z,z) \land (\exists y)(\neg P(z,y) \lor R(y,z)))$