Assignment #2
Due: 8th of April, 2021

NOTE: Read this please

1 - Take a print of this assignment (If there is no nearby printer then write it again in the same format along with the spaces provided for answer.
2 - some questions may need you to do some rough work. Do it on a blank sheet and write on the top of the sheet 'Rough Work'
3 - Solve it using pen
4 - Take snaps
5 - Make a pdf
6 - Submit

Q1: Use the principle of resolution to show that the hypothesis "Chohan works hard", "If Chohan works hard then he is a dull boy", "if Chohan is a dull boy, he will not get a job" imply the conclusion "Chohan will not get the job". **(Marks 3)**

Solution:

P1:	C1:	
P2:	C2:	
P3:	C3:	
C:	C4:	
	C5:	From ___ and ____
	C6:	From ___ and ____
	C7:	From ___ and ____

Q2: Write the negation of the following statements in English using the logical equivalence of $\sim\forall x\ P(x) = \exists x \sim P(x)$ and $\sim\exists x\ P(x) = \forall x \sim P(x)$. No credit will be given if you didn't use these logical equivalences. **(6 marks)**

a. $\forall x \forall y\ (P(x,y) \rightarrow \sim Q(x,y))$

Solution:

b. $\exists x \forall y\ (P(x,y)\ V \sim Q(x,y))$

Solution:

Note: When you are done with simplification of the quantifiers then also use the equivalences of $P \rightarrow Q = \sim P\ V\ Q$ and Demorgan law to simplify further your answer. I will deduct marks if you ignore this.

Q3: Write a logical expression corresponding to the following using only the predicates, logical conjunctions, disjunction and nothing else. Assume the domain of x,y = {1,2,3} **(Marks 9)**

~∀x ∀y P(x,y) =

∃x ¬∀y P(x,y) =

∀x ∃y ¬P(x,y) =

Q4: The following question relates to the inhabitants of the island of knights and knaves created by Smullyan. **The knights only speak the truth when they are happy. The knaves always speak lie regardless they are happy or sad**. You encounter two people A and B. Determine if possible what A and B are if they address you in the way. If you cannot determine what these two people are, can you draw any conclusions? **(Marks 20)**

A says "The two of us are both knights" and
B says "A is a knave"

Solution:

P = A is a knight ~P = A is a knave
Q = B is a knight ~Q = B is a knave

Scenario 1: Assume all knights to be happy

CASE 1: _____, _____
1)
2)

CASE 2: _____, _____
1)
2)

CASE 3: _____, _____
1)
2)

CASE 4: _____, _____
1)
2)

Conclusion: A is _____, B is _____

Scenario 2: Assume all knights to be sad (means the knights will speak lies now)

CASE 1: _____, _____
1)
2)

CASE 2: _____, _____
1)
2)

CASE 3: _____, _____
1)
2)

CASE 4: _____, _____
1)
2)

Conclusion: A is _____, B is _____

Q5: Assume that the statement “if it is sunny day then I will not go to beach” is in contrapositive form. Make the following forms of this statement using English sentences **(3 marks)**
Converse:

Contrapositive:

Inverse: