MAKERERE UNIVERSITY
COLLEGE OF COMPUTING AND INFORMATION SCIENCE
DEPARTMENT OF NETWORKS
ASSIGNMENT II
DISCRETE MATHEMATICS (MTH 3105)

Question one

(a) Show that if p is an odd integer, then $4p3 + 2p - 1$ is odd.

(b) Show that if t is an even integer, then $3t^3 + 2$ is odd.

(c) Let a $\in$ Z. Then show that $a^2 + 3a + 5$ is an odd integer.

Question two

You are given a propositional language where

$\rightarrow$ A =“John comes to the city”,

$\rightarrow$ B =“Hellen comes to the city”,

$\rightarrow$ C =“Resty comes to the city”,

$\rightarrow$ D =“Daniel comes to the city”.

Translate the following propositions into their logical equivalence:

(1) If Daniel comes to the city then Hellen and Resty come too

(2) Resty comes to the city only if John and Hellen do not come

(3) Daniel comes to the city if and only if Resty comes and John doesn’t come

(4) If Daniel comes to the city, then, if Resty doesn’t come then John comes

(5) Resty comes to the city provided that Daniel doesn’t come, but, if Daniel comes, then Hellen doesn’t come”

(6) A necessary condition for John coming to the city, is that, if Hellen and Resty aren’t coming, Daniel comes”

(7) John, Hellen and Resty come to the city if and only if Daniel doesn’t come, but, if neither John nor Hellen come, then Daniel comes only if Resty comes

Question Three

(a) Use the laws of logic to show that the two propositions are logically equivalent by clearly stating at each step the law used.

(i) $(s \wedge t) \rightarrow u \equiv s \rightarrow (t \rightarrow u)$

(ii) $(t \vee u) \rightarrow s \equiv (t \rightarrow s) \wedge (u \rightarrow s)$

(b) Use inference rules to build the argument in the following propositional logic. You need to indicate the rule used, any assumption made if any, the premise and any other law of logic you brought in where necessary at each and every step.

(i) Premises: $s \rightarrow (t \wedge u)$, $v \rightarrow u$, $u \rightarrow s$. Prove: $v \rightarrow t$.

(ii) Premises: $\neg(u \vee v)$, $\neg s \rightarrow v$, $s \rightarrow t$. Prove: t.