Question 1: **[Marks: 1+3+3+3=10]**

Formally specify the system in VDM-SL.

Consider a system that records the current mode of an industrial robot, which can either be working, idle or broken.

(a) Declare a type, Mode, for use in the specification.

(b) Define the state of the system in VDM with the state variable *initialMode* of the type Mode including an invariant function. Further, the state includes an initialization function that ensures that the robot is set to idle when the system first comes into existence.

(c) Write specifications for the following operations in VDM-SL:

i. An operation called setMode that accepts and records a value for the mode of the robot.

ii. An operation called getMode that outputs the current mode of the robot.

Past paper Q1

types

a) Mode = <working> | <idle> | <broken>

b) state IndustrialRobot of

initialMode : Mode

inv mk-IndustrialRobot (i) ≜ i = <idle> ∨ <working> ∨ <broken>

init mk-IndustrialRobot (i) ≜ i = <idle>

end

c) i) setmode (m : mode)

ext wr initialMode : Mode

pre TRUE

post initialmode = <m>

getmode () currentmode : Mode

ext rd initialmode : Mode

pre TRUE

post currentmode = initial mode

isIdle () query : B

ext rd initialMode : Mode

pre TRUE

post query ⇔ initialmode = <idle>