AFE BABALOLA UNIVERSITY, ADO-EKITI, EKITI STATE, NIGERIA
COLLEGE OF ENGINEERING
DEPARTMENT OF CHEMICAL AND PETROLEUM ENGINEERING

B.ENG. CHEMICAL ENGINEERING ASSIGNMENT III

CHE 532: Process Dynamics and Control II

Session: 2019/2020   **Semester:** Second   **Unit:** 2   **Duration:** 1½ days

Instruction(s): Answer all the questions.

Question 1 [50 Marks]
The transfer function of a CSTR is given as in Equation (1) while that of a jacket surrounding it is as shown in Equation (2).

a) Obtain the open-loop dynamic response of the plant to a 0.1-unit step change applied at t = 5 min to its input variable.

b) Applying a step change of 2.5 units to the set point of the output variable at t = 5 min, taking the simulation time to be 90 min and P, I and D of the controllers to be 1.1, 0.1 min-1 and 2.1 min, respectively, show the closed-loop graphical responses of the plant using conventional PID feedback control system and cascade PID control system.

c) Compare all the graphical responses obtained using one graph.

d) Compare the integral absolute errors (IAE) of the closed-loop simulations.

$$G_{pp}(s) = \frac{3}{4s+1}\frac{5}{6s+1} \tag{1}$$

$$G_{ps}(s) = \frac{1}{2s+1} \tag{2}$$