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

B.ENG. CHEMICAL ENGINEERING TEST

CHE 532: Process Dynamics and Control II

Session: 2019/2020 **Semester:** Second **Unit:** 2 **Duration:** 24 hr

Instruction(s): Solve the problem. Any value required but not given in the problem statement should be assumed and stated.

Problem Statement [100 Marks]

The theoretical model of a liquid tank system has been formulated to be as given in Equation (1), where the area of the tank, $A = 0.5\,m^2$ and the arbitrary constant, $\beta = 1.5\,\frac{m^{\frac{5}{2}}}{\min}$. The data generated for the plant identification of the system are contained in the Microsoft Excel file named "nnverileri". Applying **Neural Network Model Predictive Control (NNMPC),** also referred to as **NN Predictive Control**, develop a MATLAB/Simulink model for the set-point tracking (servo) control of the system. The Simulink model should be simulated via a MATLAB *mfile* program by passing the set-point value into the system using an "Inport" block. The graphical response of the closed-loop system should be displayed in form of X(2Y) Graph. Also, the control system should save the outputs (time, dynamic height and set-point height) in a MAT- ("*.mat"*) file having file name and variable name to be "yourfirstname.mat" and "tycikis", respectively. The application of the developed NNMPC system should be demonstrated using a case study of the liquid height of the tank being desired to be 2.5 m or any other value of your choice.

$$\frac{dh}{dt} = \frac{\left(F_i - \beta\sqrt{h}\right)}{A} \tag{1}$$

Note: The submission will be done on the portal by uploading the ***mfile,*** the **Simulink model** and the portable document formatted (PDF) **graphical output** zipped in a folder named with your matriculation number without any slash.

Submission Date and Time: 2nd May, 2020 and 10:00 am