Project 1

Due Date: 20/11/2023

(You can work in a group of 5 people)

(a) In this project you are tasked with improving the performance of a power plant operating on a basic ideal Rankine cycle (shown in Fig). The current cycle has a thermal efficiency of 41 % and a steam quality (at the condenser inlet) of 76 %. Your goal is to modify given ideal Rankine cycle to increase the efficiency over 46 % and raise the steam quality (x) to above 85 %. The boiler pressure and condenser pressure must remain at 15 MPa and 10 kPa, respectively, and the turbine temperature should not exceed 500 °C.
(***Report must clearly show steam quality and modified ideal Rankine cycle efficiency)***

(b) You need to vary the boiler pressure (P_b) and condenser pressure (P_c) within the ranges of 12 MPa < P_b < 15 MPa and 10 kPa < P_c < 5 kPa. Then, create a plot that illustrates how changes in this pressure impact the thermal efficiency and net work output of the modified ideal Rankine cycle.

Your report should include the following components:

a) Introduction
b) Provide a clearly labelled *T-s* (Temperature-Entropy) diagram of modified Rankine cycle
c) Show control volume and energy balance equation for each component involved in the cycle
d) Discuss the Plot from part b.