**King Saud University**

**Mechanical Engineering Department**

**ME-374 Project**

**Fall 2016 Semester**

**Dr. Abdullah Alabdulkarem**

The project is about simulating and analyzing a steam power cycle using EES. For information about steam power cycle (or Rankine power cycle), refer to Chapter 10, Section 2. Consider the fuel to be crude oil with a lower heating value of 42,000 kJ/kg and CO2 intensity of 40 g CO2/MJ. The cycle net power is 30 MW. Assume the boiler inlet pressure is 9 MPa and has a 700 kPa pressure drop. The steam temperature at the inlet of the turbine is 400oC. Assume the turbine isentropic efficiency is 85%. The condenser pressure is 10 kPa. Make any necessary assumption.

1. Find the steam mass flow rate, thermal efficiency, barrels of oil needed per day and CO2 emissions per day. (4 points)
2. Find the maximum power potential of the turbine, assuming ambient at 25oC and exergy destroyed in the steam turbine only. (1 point)
3. Plot the T-s diagram, system schematic and label the cycle state points and the relevant components (1 points)
4. Investigate the effect of varying the condenser pressure from 5 kPa to 40 kPa, with a step of 5 kPa, on the power cycle efficiency and plot the results. (1.5 points)
5. Investigate the effect of varying the steam temperature from 390oC to 550oC, with a step of 10oC, on the power cycle efficiency and plot the results. (1.5 points)
6. Discuss your findings. (1 points)

**Requirements**

* The project is an individual effort. No collaboration is allowed. About 20% of the students would be randomly selected to present and discuss their project. Those students are required to show that they understand their project and competent in their EES code. In case you have any question or need any help, please don't hesitate to contact me.
* Attendance to one EES workshop is required for grading. 2 Points will be deducted if you did not attend the workshop.
* Submit a printed report, including your name, university ID, problem statement, system schematic, assumptions, EES code, results and conclusion by 10 am on 11/30/2016. Two points are deducted for each day from projects submitted after the deadline.
* You can use the EES installed in the computer center.
* Write the following statement, on the project cover page, and sign under it (*I certify that I have not given or received any unauthorized assistant in the project.*)