



APPLIED THERMODYNAMICS
TUTORIAL 3

Dated 17.8.2016

Time: 50 Mins

Q.1 An ideal reheat Rankine cycle with water as the working fluid operates the boiler at 15,000 kPa, the reheater at 2000 kPa, and the condenser at 100 kPa. The temperature is 450°C at the entrance of the high-pressure and low pressure turbines. The mass flow rate through the cycle is 1.74 kg/s. Determine the power used by pumps, the power produced by the cycle, the rate of heat transfer in the reheater, and the thermal efficiency of this system

Q. 2 Turbine bleed steam enters an open feedwater heater of a regenerative Rankine cycle at 200 kPa and 150°C while the cold feedwater enters at 40°C. Determine the ratio of the bleed steam mass flow rate to the inlet feedwater mass flow rate required to heat the feedwater to 110°C.

Q.3 How do the following quantities change when the simple ideal Rankine cycle is modified with regeneration? Assume the mass flow rate through the boiler is the same.

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| Turbine work output | (a) increases (b) decreases (c) remains the same |
| Heat Supplied | (a) increases (b) decreases (c) remains the same |
| Heat Rejected | (a) increases (b) decreases (c) remains the same |
| Moisture content at turbine exit | (a) increases (b) decreases (c) remains the same |

Q. 4 Consider a simple ideal Rankine cycle and an ideal regenerative Rankine cycle with one open feedwater heater. The two cycles are very much alike, except the feedwater in the regenerative cycle is heated by extracting some steam just before it enters the turbine. How would you compare the efficiencies of these two cycles?

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