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06ME6023 **Reg. No** _____

Name _____

A P J ABDUL KALAM TECHNOLOGICAL UNIVERSITY

M.TECH DEGREE EXAMINATION, DECEMBER 2020

FIRST SEMESTER

ENERGY MANAGEMENT

ENERGY CONVERSION SYSTEMS

Time: 3 Hours **Max. Marks: 60**

Use of steam tables is permitted

PART A

Answer ALL questions

1. Explain the working of thermal liquid heaters.
2. How the efficiency is improved in Rankine cycle with feed water heaters?
3. Describe the principle of STAG.
4. Explain a fission chain with an example **.**

(4 x 5 marks =20 marks)

PART B

5. Draw a neat schematic diagram of a thermal power plant and explain the working of each part .

OR

6. Draw a neat line diagram of any one of water tube boiler and explain its working. Also discuss its relative merits and demerits.

7. A steam power plant operates on a simple Rankine cycle. If the isentropic efficiency of the turbine is 87 percent and the isentropic efficiency of the pump is 85 percent, determine
   (a) the thermal efficiency of the cycle and
   (b) the net power output of the plant for a mass flow rate of 15 kg/s**.**

OR

8. A small power plant of 500kW capacity is supplied with a steam at 30bar and 300 ^{0}C, the condenser pressure is 0.04bar.
   a. Determine the Rankine efficiency and steam generation rate of boiler in kg/s.
   b. If a feed water of mixing type is used at 7bar pressure, then find the efficiency of the cycle and steam generation rate.

9. A gas-turbine power plant operates on simple Brayton cycle with air as the working fluid and delivers 32MW of power. The minimum and maximum temperatures in the cycle are 310K and 900K, and the pressure of air at compressor exit is 8 times the value at the compressor inlet. Assuming an isentropic efficiency of 80% for compressor and 86% at for turbine, determine

   (a) Exit temperature of turbine.
   (b) Mass flow rate of air through the cycle.

OR

10. Consider an ideal air-standard Brayton cycle in which the air into the compressor is at 100 kPa, 20°C, and the pressure ratio across the compressor is 12:1. The maximum temperature in the cycle is 1100°C, and the air flow rate is 10 kg/s. Assume constant specific heat for the air. Determine the compressor work, the turbine work, and the thermal efficiency of the cycle. Assume the compressor isentropic efficiency as 85% and the turbine isentropic efficiency as 88%.

11. (a) With an example, explain the binding energy of a nucleus. (3 Marks)
    (b) Draw the cross sectional view of a CANDU fuel element assembly and Explain each part. (7 Marks)

OR

12. Explain working of liquid metal fast breeder nuclear reactor with a neat figure.

(4 x 10 marks =40 marks)