Roll No											

PRESIDENCY UNIVERSITY
BENGALURU

SET A

SCHOOL OF ENGINEERING
END TERM EXAMINATION - JAN 2024

Semester : Semester V - 2021
Course Code : MEC3025
Course Name : Power Plant Engineering
Program : B.Tech.

Date : 08-JAN-2024
Time : 9:30AM - 12:30 PM
Max Marks : 100
Weightage : 50%

Instructions:
(i) Read all questions carefully and answer accordingly.
(ii) Question paper consists of 3 parts.
(iii) Scientific and non-programmable calculator are permitted.
(iv) Do not write any information on the question paper other than Roll Number.

PART A

ANSWER ALL THE QUESTIONS **4 X 5M = 20M**

1. Explain hydroelectric power plant with diagram.
(CO1) [Knowledge]

2. Define isentropic efficiency of Pump. Also write the formula for isentropic efficiency of Pump.
(CO2) [Knowledge]

3. Define isentropic efficiency of turbine. Also write the formula for isentropic efficiency of turbine.
(CO2) [Knowledge]

4. Explain Water tube boiler with diagram
(CO2) [Knowledge]

PART B

ANSWER ALL THE QUESTIONS **5 X 10M = 50M**

5. Explain construction and working of Pressurized Water Reactor with help of neat and clean diagram.
(CO3) [Comprehension]

6. With help of neat and clean diagram explain working of Pelton Turbine.
(CO3) [Comprehension]

7. Explain Reheating in Brayton cycle with block diagram. Also plot pressure-volume diagram and temperature entropy diagram showing all points clearly.
(CO4) [Comprehension]

8. Explain closed brayton cycle with neat and clean block diagram. Also, plot Pressure-volume and Temperature-Entropy diagram showing all the processes clearly.
(CO4) [Comprehension]

9. Explain Regenerative-Brayton cycle with block diagram. Also, plot Temperature Entropy diagram showing regenerative cycle.

(CO4) [Comprehension]

PART C

ANSWER ALL THE QUESTIONS **2 X 15M = 30M**

10. Brayton cycle is an ideal cycle for gas turbine power plant. In a simple Brayton cycle, the pressure ratio is 8 and temperatures at the entrance of compressor and turbine are 300 *K* and 1400 *K*, respectively. Both compressor and gas turbine have isentropic efficiencies equal to 0.8. For the gas, assume a constant value of C_p (specific heat at constant pressure) equal to 1 *kJ/kg-K* and ratio of specific heats as 1.4. Neglect changes in kinetic and potential energies.

A) Plot pressure-volume (P-V) diagram and Temperature-Entropy(T-S) diagram showing both ideal and real cycle.

B) Find the power required by the compressor in *kW/kg* of gas flow rate

C) Find the Turbine output and heat input to the cycle.

D) Find the thermal efficiency of the cycle in percentage (%).

(CO3) [Application]

11. a) In an ideal Brayton cycle, atmospheric air (ratio of specific heats, *cp/cv* = 1.4, specific heat at constant pressure = 1.005 kJ/kg.K) at 1 bar and 300 K is compressed to 8 bar. The maximum temperature in the cycle is limited to 1280 K. If the heat is supplied at the rate of 80 MW, Find the mass flow rate (in kg/s) of air required in the cycle.

b) Consider a simple gas turbine (Brayton) cycle and a gas turbine cycle with perfect regeneration. In both the cycle, the pressure ratio is 6 and the ratio of the specific heats of the working medium is 1.4. The ratio of minimum to maximum temperatures is 0.3 (with temperature expressed in K) in the regenerative cycle.Find the ratio of the thermal efficiency of the simple cycle to that of the regenerative cycle.

(CO4) [Application]