BACHELOR OF TECHNOLOGY (C.B.C.S.) (2014 COURSE)
B.Tech.Sem - VIII MECHANICAL : WINTER- 2022
SUBJECT : POWER PLANT ENGINEERING

Day : Thursday

Time : 02:30 PM-05:30 PM

Date : 24-11-2022   **W-13464-2022**   Max. Marks : 60

N.B.:

    1) All questions are **COMPULSORY**.

    2) Figures to the right indicate **FULL** marks.

    3) Assume suitable data if necessary.

Q.1   Discuss the present status of generation in India. Comment on impact of **(10)** power generation on economical development of nation.

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OR

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Discuss the role and participation of private sector in development of power **(10)** sector in India. Name few companies which are involved in such a process. What are the issues involved in energy planning in India?

Q.2   Air is drawn in gas turbine unit at 15^0C and 1.01 bar and pressure ratio is **(10)** 7:1. The compressor is driven by the H.P. turbine and L.P. turbine drives a separate power shaft. The isentropic efficiencies of compressor and the H.P. and L.P. turbine are 0.82, 0.85 and 0.85 respectively. If the maximum cycle temperature is 610^0C. Calculate:-

    i)   The pressure and temperature of the gases entering the power turbine.

    ii)   The net power developed by the unit per Kg/s mass flow.

    iii)   The work ratio.

    iv)   The Thermal efficiency of the unit Neglect the mass of fuel and assume the following.

For compression process C_{pa}= 1.005 kj/kgK and γ =1.4

For combustion and expansion process C_{pg}=1.15 kJ/kg K and γ = 1.333.

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OR

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In a Gas turbine the compressor takes in air at a temperature of $15\ ^0$C and **(10)** compresses it to four times the initial pressure with an isentropic efficiency of 82%. The air is then passed through a heat exchanger heated by the turbine exhaust before reaching the combustion Chamber. In the heat exchanger 78% of the available heat is given to the air. The maximum temperature after constant pressure combustion is 600^0C and the efficiency of the turbine is 70%. Neglecting all losses except those mentioned and assuming the working fluid throughout the cycle to have the characteristics of air find the efficiency of the cycle

Assume R = 0.287 kJ/kg K

γ = 1.4 for air and constant specific heats throughout.

Q.3   Draw and explain diagram of steam condensing plant. What do you mean **(10)** by vaccum efficiency of condenser and what is the effect of air leakage on performance of a condenser.

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What is the Nozzle efficiency? Explain the effect of friction on steam flow **(10)** through a nozzle and super saturated or metastable expansion of steam in a nozzle.

Q.4 Explain with a neat diagram a wind electric generating power plant. Write **(10)** a short note on wind Electricity Economics.

OR

Explain the construction and working of Diesel P-V wind –PV and micro **(10)** hydel PV with neat sketch.

Q.5 Discuss the performance of power plant considering input output curve. **(10)** Define heat rate and incremental heat rate. Show that heat rate of input output is minimum when it is equal to incremental rate.

OR

Discuss the nature of load duration curves for any two consumers. Explain **(10)** with neat sketch load duration curve.

Q.6 What do you understand by energy storage technologies? Discuss in detail. **(10)** Explain pumped Hydroelectric storage with neat sketch.

OR

What do you understand by plant safety and maintenance in power plant? **(10)** Explain hydrostatic and air leakage test for power plant.

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