PB-317

[6270]-110

B.E. (Mechanical) (Insem)
ENERGY ENGINEERING
(2019 Pattern) (Semester - VIII) (402049)

Time : 1 Hour]   *[Max. Marks : 30*

Instructions to the candidates:

1) *Answers Q1 or Q2, Q3 or Q4.*

2) *Neat diagrams must be drawn wherever necessary.*

3) *Figures to the right of each question indicate full marks.*

4) *Assume Suitable data wherever necessary and mention the same clearly.*

5) *Use of steam tables, mollier chart and calculator is allowed.*

Q1) a) What do you mean by high pressure boilers? Discuss the construction and working of Benson boiler with neat sketch. **[7]**

b) The steam at 70 bars and 500 degrees Celsius is supplied to the steam turbine. The steam is expanded in a high-pressure turbine isentropically till it is dry saturated. The steam is reheated up to 400-degree Celsius passing through the reheater. Expansion after reheating is carried out to condenser pressure to 0.2 bars. Draw cycle arrangement and T-s diagram **[8]**
Determine :

i) Thermal efficiency of the cycle

ii) Work output in MW if the steam flow rate is 10 kg/sec.

OR

Q2) a) Explain in brief site selection criteria for thermal power plants. State the types of coal based on carbon content with suitability on thermal power plant. **[7]**

b) In a regenerative Rankine cycle steam enters in turbine at 120 bars and 550 degrees Celsius and leaves at 0.05 bars. Steam is bled from turbine at 20 bars pressure for heating in open feed water heater. Draw cycle arrangement and T-s diagram **[8]**
Determine

i) The thermal efficiency of the cycle

ii) Specific steam consumption

P.T.O.

Q3) a) How condenser water cooling systems are classified? Discuss closed type condenser water cooling systems with simple diagram. **[7]**

b) Following data is available from test on surface Condenser **[8]**

Barometer Reading :	760 mm of Hg
Condenser Vacuum :	700 mm of Hg
Hot well Temperature :	30 degree Celsius
Mean Condenser Temperature :	34 degree Celsius
Rate of condensate :	1.78 Tph
Cooling water inlet Temperature :	22 degree Celsius
Cooling water outlet Temperature :	32 degree Celsius
Quantity of Cooling Water :	1.54 Tones per minute
Sp heat of Water :	4.187 kJ/Kg-K
Gas constant for air :	0.287 kJ/Kg-K

Determine :

i) Vacuum Efficiency

ii) Condition of steam at condenser inlet

iii) Mass of air present per cubic meter

OR

Q4) a) What do you mean by ESP? Discuss the working principle and function of the same with simple diagram. **[7]**

b) In a thermal power plant steam is condensed in a surface condenser at 14000 kg/hr and leakage is 6 kg/hr. The vacuum near the suction pump is 69 cm of Hg and temperature is 35 °C. The air and condensate are removed by wet air pump. Take barometer pressure as 760 mm of Hg. **[8]**

Determine :

i) The capacity of the air pump in kg/min

ii) The dimensions of the air pump if N=120rpm, L/D=1.2 and pump is single acting. Take volumetric efficiency of pump as a 100 %

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