C14-M-504

4645

BOARD DIPLOMA EXAMINATION, (C-14)

MARCH / APRIL - 2019

DME - V SEMESTER EXAMINATION

HEAT POWER ENGINEERING - II

Time : **3** Hours] [Total Marks : **80**

PART - A **3×10=30**

Instructions : *(1) Answer **ALL** questions.*
*(2) Each question carries **THREE** marks.*
(3) Answer should be brief and straight to the point and shall not exceed five simple sentences.

1 Define dryness fraction of a vapour with mathematical expression.

2 Determine the condition of steam if its pressure is 10 bar and enthalpy is 2700 KJ/Kg.

3 Define the terms the mountings and accessories of the boiler.

4 Write the differences between fire tube boiler and water tube boiler.

5 Define nozzle. List different types of nozzles.

6 A steam nozzle is supplied with steam having an initial velocity of 50 m/s. The initial and exit enthalpy conditions are h_1 = 3100 KJ/Kg and h_2 = 2700 KJ/Kg. Neglecting friction. Find the exit velocity of steam.

7 Write the differences between impulse and reaction turbines.

8 State the functions of governor.

9 Distinguish between jet condenser and surface condenser.

10 Define the following terms :

(a) Condenser efficiency

(b) Vacuum efficiency

PART - B 10×5=50

Instructions : *(1) Answer any **FIVE** questions.*

*(2) Each question carries **TEN** marks.*

(3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.

11 Calculate the specific entropy of steam at a pressure of 30 bar under the following conditions :

(a) Steam is wet.

(b) Steam is dry and saturated.

(c) Steam is superheated with degree of superheat at 50°C.

12 Draw a legible sketch of Cochran boiler with its mountings and describe its working.

13 (a) Write the functions of safety valve. List different types of safety valves used in boiler.

(b) Draw a legible sketch of bourdon pressure gauge and describe its working.

14 Wet steam at 15 bar and dryness fraction of 0.97 is discharged through a convergent – divergent.
Nozzle to a back pressure of 0.2 bar. If the mass flow rate is 0.55 kg/s. Determine the throat and exit diameters. Assume friction factor 0.88 in the divergent portion of the nozzle.

15 (a) Derive an expression for exit velocity of steam through a nozzle.

(b) Explain the evaporative surface condenser with a legible sketch.

16 Following observations were made during a trial on a steam condensate :

Barometric pressure = 760 mm of hg

Vacuum reading = 700 mm of hg

Rate of cooling water = 1000 Kg/min.

Inlet temperature of cooling water = 20°C

Outlet temperature of cooling water = 30°C

Quality of steam condensed = 20 Kg/min.

Howell temperature = 32°C

Mean temperature of condensate = 35°C

Determine :

(i) vacuum efficiency

(ii) Condenser efficiency

(iii) Dryness fraction of exhaust steam

(iv) Sub-cooling of condensate

(v) Amount of air leakage per kg of steam condensed.

Assume, R for air = 0.287 kJ/kgk and C for water = 4.18 kJ/kgk.

17 A delaval steam turbine is supplied with 1 kg steam per sec. from a set of nozzles whose pressure range is 10 bar to 0.2 bar. The nozzle angle is 22° and blade exit angle is 30°. The mean blade speed is 250 m/s. If the nozzle efficiency is 80%, find the

(a) Power developed

(b) Blade efficiency and

(c) Inlet angle of blade

18 (a) Explain nozzle control governing of steam turbine.

(b) Explain briefly velocity compounding in an impulse turbine.
