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C14–M–**504**

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**BOARD DIPLOMA EXAMINATION, (C–14)**

**MARCH/APRIL—2017**

**DME—FIFTH 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) Answers should be brief and straight to the point and shall not exceed *five* simple sentences.

(4) Use of steam tables are permitted.

1. Define dryness fraction of a vapour with mathematical expression.

2. Steam is heated at constant volume from wet state to superheated state. Show this process on *P-V* and *T-S* diagrams.

3. Differentiate between fire tube and water tube boilers.

4. What is the function of safety valve? Mention its types.

5. What is a steam nozzle? List out different types of steam nozzle.

**6.** A steam nozzle is supplied with steam having an initial velocity of 50 m/s. The initial and exit enthalpies are 3000 kJ/kg and 2600 kJ/kg respectively. Neglecting friction, find the exit velocity of steam.

**7.** Explain clearly the differences between impulse turbine and reaction turbine.

**8.** Write the necessity of governing of steam turbines.

**9.** What are the advantages of surface condenser over jet condenser?

**10.** In a condenser vacuum is 715 mm of Hg when the barometer reads 765 mm of Hg. The inlet temperature of cooling water is 15 °C and outlet temperature of water is 25 °C. Determine the condenser efficiency.

<center>**PART—B**         10×5=50</center>

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

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

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

               (4) Use of steam tables are permitted.

**11.** A vessel contains 2 kg of dry steam at a pressure of 8 bar. Find the amount of heat which must be rejected so as to reduce the dryness fraction of steam in the vessel to be 70%.

**12.** Draw a neat sketch of Babcock and Wilcox boiler showing the path of flue gases and water. Describe its working.

**13.** What is the function of boiler mountings? Explain any two boiler mountings with neat sketches.

**14.** Dry saturated steam at a pressure of 8 bar enters a convergent-divergent nozzle and leaves it at a pressure of 1 bar. If the flow is isentropic, and the corresponding expansion index is 1·135, find the ratio of cross-sectional area at exist and throat for maximum discharge.

**15.** *(a)* What is the function of steam injector? State its working principle with a neat sketch.

*(b)* Explain the working principle of low-level counter-flow jet condenser with legible sketch.

**16.** Steam issues from a nozzle at 800 m/s. The velocity of moving blade is 200 m/s and the mass of steam flow is 1·5 kg/s. The nozzles are inclined at 16° to the plane of the wheel; taking friction factor is 0·85 and outlet angle of blade as 30°. Find—

*(a)* power developed;

*(b)* the blade angle at inlet;

*(c)* the blade efficiency;

*(d)* axial thrust.

**17.** Explain the working of Parson's reaction turbine with a sketch.

**18.** Data from the trail on a surface condenser is as follows :

Barometer reading = 760 mm of Hg

Condenser vacuum = 705 mm of Hg

Condenser mean temperature = 35 °C

Hot well temperature = 28 °C

Temperature rise of cooling water = 16 °C

Mass of steam condensed = 2000 kg/h

Mass of water circulated = 60000 kg/h

Cooling water inlet temperature = 20 °C

Evaluate—

*(a)* corrected vacuum to standard barometer reading;

*(b)* vacuum efficiency;

*(c)* condenser efficiency;

*(d)* condition of steam leaving the condenser;

*(e)* mass of air present in the condenser per unit condenser volume.

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