



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.

PART—B

10×5=50

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

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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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