



C16-M-403

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BOARD DIPLOMA EXAMINATION, (C-16)  
MARCH/APRIL—2018  
DME—FOURTH SEMESTER EXAMINATION  
HEAT POWER ENGINEERING

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 table permitted.

- \* 1. State any three conditions of minimum work done in two-stage compression.
2. Write any three differences between gas turbines and IC engines.
3. Write any three fuels used in jet propulsion.
4. Define dryness fraction of steam and write the formula.
5. Define boiler thermal efficiency and write its formula.
6. List out any six boiler accessories.
7. A steam nozzle is supplied with steam having an initial velocity of 50 m/s. The initial and exit enthalpies are  $H_1 = 3000$  kJ/kg and  $H_2 = 2600$  kJ/kg. Neglecting friction, find the exit velocity steam.

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8. What is compounding of steam turbines? Write three methods of compounding.
9. List out any three methods of governing.
10. Write any three differences between jet and surface condensers.

**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.

11. A single-stage air compressor has an effective swept volume of  $5 \text{ m}^3/\text{min}$  and delivers at a pressure of 6.5 bar. The temperature and pressure at end of suction stroke is  $35^\circ\text{C}$  and 1.03 bar respectively. Take  $n = 1.3$ . Calculate—
- (a) the mass of air compressed/min;
- (b) temperature at end of compression;
- (c) power required to run the compressor.
12. (a) State the differences between open-cycle and closed-cycle gas turbines.
- (b) Explain the working of Ramjet engine with a neat sketch.
13. Determine the mass and enthalpy of  $0.5 \text{ m}^3$  of wet steam with a degree of wetness equal to 10 percent and a pressure of 10 bar.
14. Explain with neat sketch the working of La-Mont boiler.
15. Dry saturated steam enters a steam nozzle at a pressure of 12 bar expands isentropically to 2 bar pressure. Determine—
- (a) quality of steam at exit;
- (b) exit velocity.

- 16.** <sup>\*</sup> Steam is supplied to a single-stage impulse turbine at 5 bar and 160 °C, from where it is exhausted to a condenser at a pressure of 0.2 bar. The blade speed is 300 m/s. The nozzles are inclined at 25° to the plane of the wheel and outlet blade angle is 35°. Assume steam flow rate as 30 kg/min. Calculate—
- (a) power developed by the turbine;
  - (b) diagram efficiency.
- 17.** (a) In a boiler test, steam at a pressure of 14 bar, having a dryness fraction 0.9, is generated at the rate of 8 kg per kg of coal burnt. The calorific value of coal fired is 35000 kJ/kg and temperature of feed water is 45 °C. Calculate the thermal efficiency of the boiler.
- (b) Write any five differences between impulse and reaction turbines.
- 18.** (a) Explain the working principle of evaporative surface condenser with a legible sketch.
- (b) In a condenser, vacuum is 715 mm of Hg. The inlet temperature of cooling water is 15 °C and outlet temperature of water is 25 °C. Determine the condenser efficiency.

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