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C14–M–504

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BOARD DIPLOMA EXAMINATION, (C–14)

OCT/NOV—2016

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.

(2) Use of steam tables is permitted.

1. What is the condition of steam if its pressure is 10 bar and enthalpy is 2700 kJ/kg?

2. Define the following terms of steam quality :

(a) Wet steam

(b) Dry steam

(c) Superheated steam

3. A boiler generates 6200 kg of steam per hour at 9 bar and 0·93 dry from feed water at 38 °C, when using 825 kg of coal per hour having heating value of 31000 kJ/kg. Determine the efficiency of the boiler.

4. List all the boiler mountings and boiler accessories.

5. Steam enters a nozzle at 15 bar and 300 °C and expands to 2 bar and a quality of 85 percent dry. Determine velocity at exit. Neglect the velocity of steam at inlet.

6. Write the applications of steam nozzles.

7. What is a turbine? How are the steam turbines classified?

8. Find the maximum efficiency and optimum blade speed ratio of a de Laval turbine where the nozzle angle is 20°.

9. Define the following :

(a) Condenser efficiency

(b) Vacuum efficiency

10. What is the function of an air pump used with a condenser?

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 is permitted.

11. 2 kg of steam initially at a pressure of 15 bar and a temperature of 300 °C expands polytropically to 1·5 bar. Find *(a)* the final condition, *(b)* work transfer and *(c)* heat transfer. Assume index of expansion n 1 25.

12. Explain the working of Benson boiler with the help of a neat sketch.

13. What are the various types of draught systems in boilers? Explain.

14. 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 and *(b)* exit velocity. Assume the inlet velocity to nozzle is zero.

15. *(a)* Describe with a neat sketch the working of a steam injector.

(b) With a neat sketch, explain the working of an ejector condenser.

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 2 kg/s. The nozzles are inclined at 16° to the plane of the wheel; taking friction factor as 0·8 and outlet angle of blade as 30°. Find *(a)* power developed, *(b)*the blade angle at inlet, *(c)* the blade efficiency and *(d)* axial thrust.

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

18. The following observations were made during a trail on a steam condenser :

Barometric pressure	:	760 mm of Hg
Vacuum pressure	:	700 mm of Hg
Rate of cooling water	:	1000 kg/minute
Inlet temperature of cooling water	:	20 °C
Outlet temperature of cooling water	:	30 °C
Quantity of steam condensed	:	20 kg/minute
Hotwell temperature	:	32 °C
Mean temperature of the condensate	:	35 °C

Determine the following :

(a) Vacuum efficiency

(b) Condenser efficiency

(c) Dryness fraction of exhaust steam

(d) Sub-cooling of condensate

(e) Amount of air leakage per kg of steam condensed

Assume, R for air = 0·287 kJ/kg-K and specific heat of water = 4·18 kJ/kg-K.

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