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BOARD DIPLOMA EXAMINATION, (C-16)

JANUARY/FEBRUARY—2022

DME - FOURTH SEMESTER EXAMINATION

THERMAL 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.

1. Define the term dryness fraction and give its mathematical expression. Explain the terms involved in it.

2. List out steam boiler accessories and state their functions.

3. Represent the constant volume process on P-V and T-S diagram and write the expression for work done.

4. List out different calorimeters used to find the quality of wet steam.

5. Explain the effects of frictional flow through the nozzle with the help of H-S diagram.

6. Define the terms blade speed ratio and friction coefficient.

7. Define the term steam condenser and state its effect on the efficiency of thermal power plant.

8. Draw the P-V and T-S of Atkinson's cycle and name the processes.

9. What is the function of Jet exit nozzle in propulsion units?

10. What is the function of differential in automobile?

PART—B

10×5=50

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

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

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

11. A rigid vessel of volume 0·5 m^3 contains steam at 25 bar with dryness fraction 0·87. Determine the mass and enthalpy of steam. Also calculate the amount of heat required to raise the temperature of steam to 400 °C. Assume the specific heat of superheated vapour as 2·1 kJ/kg K.

12. Explain the construction and working principle of Babcock–Wilcox boiler with neat sketch.

13. A cylinder contains 0·03 m^3 of steam 0·8 dry at 16 bar. The steam expands hyperbolically until the volume becomes 0·24 m^3. Calculate the final pressure, final dryness fraction, the work done and heat transferred.

14. A steam nozzle is supplied steam at 15 bar 350 °C and discharge steam at 1 bar. If the diverging portion of the nozzle is 80 mm long and the throat diameter is 6 mm, determine the cone angle of the divergent portion. Assume 12% of the total available enthalpy drop is lost in friction in the divergent portion. Also determine the velocity at throat and exit.

15. In a De Laval turbine, steam issues from the nozzle with a velocity of 1200 m/s. The nozzle angle is 20°, the mean blade velocity is 400 m/s and blades are equiangular. The mass of the steam flowing through the turbine per hour is 1000 kg. Assume the blade velocity co-efficient as 0·8. Determine *(a)* blade angles, *(b)* power developed, *(c)* blade efficiency and *(d)* axial thrust.

16. Explain the working of principle of constant pressure open cycle gas turbine with neat sketch.

17. Explain the working of rocket engine with neat sketch.

18. Draw the layout of an automobile transmission system and write the function of each component.

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