6E7015

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B.Tech. VI Semester (Main/Back) Examination, April/May - 2017

Mechanical Engineering

6ME5A Steam Engineering

Time : 3 Hours **Maximum Marks : 80**

Min. Passing Marks : 26

Instructions to Candidates:

*Attempt any **five questions**, selecting **one question** from **each unit**. All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitable be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1) Steam table & Mollier chart *2) Property table*

Unit-I

1. a) List the advantages and disadvantages of fire-tube and water-tube Boilers. **(8)**

b) What is circulation? Differentiate between natural and forced circulation boiler. **(8)**

(OR)

1. a) What are the function of steam drum? **(4)**

b) Write short note on : **(4+4+4=12)**

i) Economizers.

ii) Pre heater

iii) Steam super heater

Unit-II

2. a) Discuss following : **(3+3=6)**

i) Steady flow energy equation in nozzles.

ii) Momentum equation for the flow through steam nozzle.

b) A convergent - Divergent nozzle expands steam from 14 bar and 300°c to 6 bar. If the flow rate is 1 kg/s. Find the throat and exit area. What should be the coefficient of velocity if the exit velocity is 550m/s? **(10)**

(OR)

2. a) Explain the physical significance of chocked flow. Discuss about the flow through convergent divergent nozzle. **(8)**

   b) Explain the term nozzle and diffuser efficiency. Mention the types of nozzle you know. **(8)**

Unit-III

3. a) What is the principle of operation of steam turbine. **(6)**

   b) Give the classification of steam Turbines. **(10)**

(OR)

3. a) What do you mean by throttle governing in steam Turbine? **(6)**

   b) The data pertaining to an impluse turbine is as follow : **(10)**

   Blade speed, 300 m/s; isentropic enthalpy drop, 450 kJ/kg; Nozzle efficiency, 0.9; Nozzle angle 20°; blade velocity coefficient, 0.85; blade exit angle, 25°.

   Calculate for a mass flow 1Kg/s

   i) The inlet angle of moving blade

   ii) Axial thrust

   iii) Driving force and power

Unit-IV

4. a) Explain stage velocity and force diagram for a impulse-reaction turbine with neat sketch. **(8)**

   b) What is the condition of maximum gross stage efficiency in parson's reaction turbine? **(8)**

(OR)

4. a) Discuss the saving in Heat Rate from regenerative heating. **(4)**

   b) Dry and saturated steam enters a steam turbine at 40bar and exhausts at 0.07 bar. It is planned to use a regenerative feed heating system employing three heaters. **(12)**

   i) Design suitable extraction points and estimate the mass of steam taken by the heater per kg of feed.

ii) Find efficiency of the regenerative cycle.

Unit-V

5. a) Explain with neat sketch reheat-regenerative feed heating cycle. Also draw T-s & h-s diagram. **(8)**

b) Steam is supplied to a turbine at a pressure of 32 bar and a temperature of 410°C. If the steam is reheated at 5.5 bar to a temperature of 395°C and then expands isentropically to a pressure of 0.08 bar. What is the dryness fraction at the end of expansion and Thermal efficiency of the cycle? **(8)**

(OR)

5. a) With the help of diagram explain Regenerative water extraction cycle. Derive expression for its efficiency. **(8)**

b) Draw neat sketch following : **(4+4=8)**

i) Pass out Turbine.

ii) Binary Vapour cycle.

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