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Total No. of Questions : 09

B.Tech.(ME) (Sem.-3)
APPLIED THERMODYNAMICS-I

Subject Code : BTME-304

M.Code : 59114

Date of Examination : 11-12-2023

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.
4. Use of steam tables is allowed.

SECTION-A

1. Answer briefly :

- a) How quality of steam can be measured?
- b) What are the four basic components of a steam power plant?
- c) Define latent heat of vaporization of fluid.
- d) Define the term lean mixture, rich mixture and stoichiometric mixture.
- e) What is the main difference between boiler mountings and boiler accessories?
- f) What is meant by saturation temperature and saturation pressure?
- g) Explain the difference between an impulse turbine and a reaction turbine.
- h) What is the function of condenser? Write two merits of surface condenser.
- i) Explain the effect of friction on the performance of a steam nozzle.
- j) Define draught. What is the use of draught in thermal power plants?

SECTION-B

2. Discuss the principle and working of any two accessories which can be used to improve the efficiency of steam power plant.
3. Derive an expression for critical pressure ratio in flow through steam nozzle. Give physical explanation.
4. "The highest compression ratio that can be used in a S.I. engine is limited by the detonation characteristics of the available fuel". Justify the statement.
5. How vacuum, vacuum efficiency and condenser efficiency are related? Explain the method of vacuum measurement.
6. In a reaction turbine, the fixed blades and moving blades are of the same shape but reversed in direction. The angles of the receiving tips are 35° and of the discharging tips are 37° and the discharging tips 20° . Find the power developed per pair of blades for a steam consumption of 2.6 kg/s, when the blade speed is 55 m/s. If heat drop per pair is 10.04 kJ/kg, find the efficiency of the pair.

SECTION-C

7. The velocity of steam, leaving the nozzles of an impulse turbine, is 1200 m/s and the nozzle angle is 20° . The blade velocity is 375 m/s and the blade velocity coefficient is 0.75. Assuming no loss due to shock at inlet, calculate for a mass flow of 0.5 kg/s and symmetrical blading : a) blade inlet angle b) driving force on the wheel c) axial thrust on the wheel d) power developed by the turbine.
8. a) What is steady flow energy equation as applied to steam nozzles? Explain its use in the calculation of steam velocity at the exit of a nozzle.
b) Which part is played by a cooling tower? What are the different types of cooling towers? Explain in brief.
9. Write a short note on :
 - a) Scavenging
 - b) Fuel pump
 - c) Atomizer
 - d) Spark plug.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.