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Total No. of Questions: 09

B.Tech.(Marine Engineering) (2013 Onwards)
B.Tech.(ME) (2011 Onwards)
(Sem.-3)

APPLIED THERMODYNAMICS-I Subject Code: BTME-304

Paper ID : [A1141]

Time: 3 Hrs. Max. Marks: 60

# **INSTRUCTION TO CANDIDATES:**

- SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
- 2. SECTION-B contains FIVE questions carrying FIVE marks each and students has to attempt any FOUR questions.
- 3. SECTION-C contains THREE questions carrying TEN marks each and students has to attempt any TWO questions.

# SECTION-A

# 1. Write briefly:

- a) Differentiate between Higher Calorific Value and Lower Calorific Value of a fuel.
- b) How does the engine power vary with altitude?
- c) What is the purpose of Turbocharging?
- d) What information is given in Mollies charts?
- e) What are super critical boilers?
- f) What is meant by Bleeding in Vapour Power Cycle?
- g) What is stage efficiency of a turbine?
- h) What is the purpose of compounding of turbines?
- i) Define Condenser Efficiency and its Calculation.
- j) List the elements of a Condensing Unit.

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### SECTION-B

- 2. Give the merits/demerits of Fire Tube Boilers and Water tube Boilers.
- 3. Describe the pressure and velocity variation in a impulse steam turbine.
- 4. What is meant by co-generation? How it is used in industries? Explain.
- 5. What is the effect of air leakage in a condenser? List methods to prevent this leakage.
- 6. Write a descriptive note on 'Cooling Towers'.

# **SECTION-C**

- 7. In a test on single cylinder four stroke cycle gas engine with explosion in every cycle, the gas consumption given by the meter was 0.216 m³ per minute, the pressure and temperature of the gas being 75 mm of water and 17°C reply. Air consumption was 2.84 kg/min, the temperature being 17°C and barometer reading 745 mm of mercury. The bore of engine being 250 mm and stroke 475 mm and *rpm* 240.
  - Find volumetric efficiency of the engine referred to volume of charge at NTP. Assume R for air as 287 Nm/kg.
- 8. The pressure under air baffle of a surface condenser is 52 mm of Hg. Temperature of the mixture leaving the cooler suction is 25°C. Assuming available water at 15.5°C and external water might lower the temperature further to 20°C. Explain the effect of this on the quality of vapour accompanying the air to the air pump suction.
- 9. The following data relates to a stage of an impulse reaction turbine: steam velocity coming out of the nozzle = 245 m/s, nozzle angle = 20°, blade mean speed = 145 m/s. speed of tree rotor = 300 *rpm*, blade height = 10 cm, specific volume of steam at nozzle outlet and blade outlet respectively 3.45 m<sup>3</sup>/kg and 3.95 m<sup>3</sup>/kg. Power developed by the turbine = 287 kW. Efficiency of the nozzle and blade combined = 90%. Carryover coefficient = 0.82. Find:
  - (i) The Heat drop in each stage,
  - (ii) Degree of reaction
  - (ii) Stage efficiency.

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