Total No. of Questions: 09

**B.Tech.(Marine Engineering) (2013 Onwards) / B.Tech.(ME) (2011 Onwards)
(Sem. – 3)**
APPLIED THERMODYNAMICS–I
M Code: 59114
Subject Code: BTME-304
Paper ID: [A1141]

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.**

SECTION A

1. a) Define atomic mass and molecular mass.

    b) Mention the various applications of I.C. engine.

    c) What is octane and cetane rating of fuels?

    d) What is meant by phase of a substance?

    e) How evaporation differs from boiling?

    f) Write the function of 'Economiser'.

    g) What is bleeding?

    h) Write the functions of nozzle used with steam turbine.

    i) Distinguish between impulse and reaction turbine.

    j) List the various losses of steam in turbine.

SECTION B

2. What do you understand by 'minimum air' and 'excess air' in context of combustion?

3. Explain the need and methods of supercharging in I.C. Engines.

4. Determine the amount of heat required to generate 5 kg of steam at a pressure of 10 bar and temperature of 250°C from water at 25°C. Take specific heat for superheated steam as 2.1 kJ/kg K.

5. Describe with a neat diagram, the construction and working of a Babcock and Wilcox water tube boiler.

6. The inlet and outlet temperatures of cooling water in a condenser are 27 °C and 35 °C respectively. If the vacuum in the condenser is 700 mm of Hg against barometric pressure of 760 mm of Hg, calculate the efficiency of the condenser.

SECTION C

7. Describe the Morse test for determining the indicated power of a multi cylinder engine, state the assumptions made.

8. In a thermal power plant operating on an ideal Rankine cycle, steam at 15 bar and 250°C enters a turbine which generates 40kW indicated power. If the steam consumption is 300 kg/hr and condenser is maintained at 0.15 bar, determine the final condition of steam, Rankine efficiency and relative efficiency. Neglect pump work. Also determine the fuel to be supplied per hour if its calorific value is 41850 kJ/kg.

9. The steam supply to an impulse turbine with a single row of moving blades is 2 kg/s. The 10 turbine develops 130 kW, the blade velocity is being 175 m/s. The steam flows from a nozzle with a velocity of 400 m/s and the velocity coefficient of blade is 0.9. Find the nozzle angle, blade angle at entry and exit, if the steam flows axially after passing over the blades.