Roll No. | | | | | | | | | | | | **Total No. of Pages : 02**

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 :
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. Write briefly :

a) Define the term compound and molecular mass.

b) What do you mean by detonation in S.I. engines?

c) Explain the terms : Quality of steam and superheated steam.

d) What are five tube boilers?

e) What is the effect of friction on the flow through the nozzle?

f) Define the terms : speed ratio and diagram efficiency related to steam turbines.

g) Why is Carnot cycle not suitable for a steam power plant?

h) What do you understand by the mean temperature of heat addition?

i) State the organs of steam condensing plant.

j) What is meant by ignition delay?

SECTION–B

2. Explain the need and methods of super charging of I.C. engines.

3. What is quality of steam? What are the different methods of its measurement? Why can't a throttling calorimeter measure the quality, if the steam is very wet? How it is measured then?

4. What is steady flow energy equation as applied to steam nozzles? Explain its use in the calculations of steam velocity at the exit of nozzle.

5. Describe with neat sketch the working of a surface condenser.

6. A blast furnace gas has the following volumetric composition CO_2 = 11%; CO = 27%; H_2 = 2%; N_2 = 60%. Find the theoretical volume of air required for the complete combustion of $1m^3$ of the gas. Find the percentage composition of dry blue gases by volume. Assume dry air contains 21% of O_2 and 79% of N_2 by volume.

SECTION–C

7. Explain with neat sketch working of Bob cock and Wilcox boiler.

8. A steam power plant uses the following cycle :

   Steam at boiler outlet : 150 bar and 550ºC

   Reheat at 40 bar to 550ºC

   Condenser at 10 kPa

   Using the Mollier chart and assuming ideal processes.

   Find (a) Quality at turbine outlet (b) cycle efficiency (c) steam rate.

9. The velocity of steam exciting the nozzle of the impulse stage of a turbine is 400 m/s. The blades operate close to maximum blading efficiency. The nozzle angle is 20º. Considering equiangular blades and neglecting blade friction calculate for a steam flow of 0.6 kg/s, the diagram power and diagram efficiency.