

Roll No.

Total No. of Pages : 02

Total No. of Questions : 09

B.Tech. (ME)/(IE-2008/09 Batch) (Sem.–3rd)

APPLIED THERMODYNAMICS-I

Subject Code : ME-209

Paper ID : [A0805]

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 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. Answer briefly :

- (a) What are the effects of knocking?
- (b) Sketch process of formation of steam on a temp–heat input diagram.
- (c) How do you classify boilers?
- (d) What is the advantage of bleeding ?
- (e) What is critical pressure ratio ?
- (f) Name various methods of compounding steam turbine.
- (g) Write the expression for maximum blade efficiency in a single stage impulse turbine.
- (h) What do you understand by governing of steam turbines?
- (i) What are the disadvantages of Jet condensers?
- (j) How the air compressors are classified?

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SECTION-B

2. Explain the phenomena of detonation in spark ignition engines.
3. What are high pressure boilers? Draw a labelled Le Mont Boiler arrangement.
4. Explain the effect of friction on the performance of a steam nozzle.
5. What is meant by a reheat cycle ? When is reheating of steam recommended in a steam power plant?
6. Describe briefly the constructional and operational aspects of a system used to experimentally determine the calorific value of sample of coal.

SECTION-C

7. Steam is available at 8 bar and 0.9 dry. Make calculations for the final dryness fraction of steam in each of the following cases :
 - (a) there is a loss of 125 kJ from the steam at constant pressure.
 - (b) the temperature of steam falls to 160°C.
 - (c) the steam expands to 3 bar pressure in a turbine stage and work equivalent of 200 kJ/kg is done.
8. A three stage steam turbine is fed at 26 bar and 370°C. The exhaust takes place at 0.05 bar. Interstage pressure : 5 bar, 1 bar. The stage efficiency for all the stages is 80%. Determine :
 - (a) runtime efficiency
 - (b) the quantity of steam at each stage
 - (c) workdone in kJ/kg at each stage
 - (d) efficiency ratio
 - (e) reheat factor.
9. 6800 kg of steam are condensed per hour and the air leakage into the condenser is 12 kg per hour. The air pump suction is screened off. The exhaust steam temperature is 32°C, the condensate temperature is 30°C and the temperature at the air pump section is 25°C. Determine.
 - (a) the mass of steam condensed in the air cooler per hour.
 - (b) the volume of air in m³ handled by the air pump.
 - (c) the percentage reduction in air pump capacity due to the cooling of the air.