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Total No. of Pages : 02

Total No. of Questions : 09

B.Tech. (ME) (Sem.-3rd)

**APPLIED THERMODYNAMICS-I**

Subject Code : BTME-304 (2011 Batch)

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 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 short notes on :

- (a) What do you understand by 'minimum air' and 'excess air' in context of combustion ?
- (b) What do you mean by pre-ignition ?
- (c) What do you understand by triple point ? Give the pressure & temperature at triple point.
- (d) How do accessories differ from mountings ?
- (e) Explain what do you mean by a super saturated flow.
- (f) What are the four basic components of a steam power plant ?
- (g) Define a steam turbine & state its field of applications.
- (h) What are the sources of air in the condenser ?
- (i) Define and explain Equivalent Evaporation.
- (j) Explain reheat factor. Why is its magnitude always greater than unity ?

### SECTION-B

2. Explain with neat sketch the function of Fusible plug.
3. A vessel of volume  $0.04 \text{ m}^3$  contains a mixture of saturated water & saturated steam at a temperature of  $250^\circ\text{C}$ . The mass of liquid present is 9 kg. Find the pressure, the mass, the specific volume, enthalpy, entropy & internal energy.
4. Derive an expression for determining mass of cooling water required in case of surface condenser.
5. Explain the phenomena of knocking in S.I. engines. What are the factors which influence the knockings ?
6. Explain the pressure compounded impulse steam turbine showing pressure and velocity variation along the axis of the turbine.

### SECTION-C

7. A gas fuel has the following percentage.  
 $\text{CO} = 10\%$ ;  $\text{H}_2 = 50\%$ ;  $\text{CH}_4 = 26\%$ ;  $\text{O}_2 = 3\%$ ;  $\text{CO}_2 = 2\%$ ;  $\text{N}_2 = 9\%$ .  
Estimate the minimum volume of air required for complete combustion of  $1 \text{ m}^3$  of the gas if 50% excess air is supplied. Give the volumes of each of dry constituents of the fine gases. Air contains 21% by volume of oxygen.
8. Determine the throat area, exit area and exit velocity for a steam nozzle to pass a mass flow of  $0.2 \text{ kg/s}$  when inlet conditions are 10 bar and  $250^\circ\text{C}$  and the final pressure is 2 bar. Assume expansion is adiabatic and that the inlet velocity is negligible. Use  $pv^{1.3} = \text{constant}$ .
9. (a) State the advantages & disadvantages of a reheating system.  
(b) Discuss the desirable characteristics of a working fluid in a vapour power cycle.