

Roll No.

Total No. of Pages : 02

Total No. of Questions : 09

B.Tech.(ME) (Sem-3)
APPLIED THERMODYNAMICS-I
Subject Code : BTME-304
M.Code : 59114
Date of Examination : 15-06-2023

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.
4. Use of steam tables is allowed.

SECTION-A

1. Answer briefly :

- a) Why excess air is supplied for combustion?
- b) What are Octane and Cetane numbers?
- c) Differentiate between conventional and high pressure boilers.
- d) Why 2-Stroke engines have been phased out?
- e) What is degree of reaction?
- f) Explain clearly the equivalent evaporation from and at 100°C.
- g) What is Dryness Fraction, how it is evaluated?
- h) What do you mean by the stage efficiency and overall efficiency of Impulse turbine?
- i) What is bleeding and for what is this carried out?
- j) What is the use of Cooling Tower in Steam Power Plant?

SECTION-B

2. Calculate the minimum quantity of air required for complete combustion of 1 m^3 of gaseous fuel which has the following composition by volume : $\text{H}_2=30\%$, $\text{CH}_4=40\%$, $\text{CO}=15\%$, $\text{CO}_2=5\%$, $\text{O}_2=2\%$ and $\text{N}_2=8\%$.
3. Describe construction and working of any one High Pressure Boiler with a neat sketch.
4. What is the need of Compounding of Turbines? Explain methods of compounding of Impulse Turbine.
5. What is the effect of air leakage in a condenser? Explain. Explain the working of air extraction pump with a neat sketch.
6. Derive an expression for evaluating Height of Chimney.

SECTION-C

7. A five stage steam turbine has steam entering at 20 bar, 300°C and leaving at 0.05 bar and 0.95 dry. Determine the Reheat factor, condition of steam at exit from each stage considering efficiency ratio (η_s) = 0.555 and all stages doing equal work.
8. A steam nozzle is supplied with steam at 15 bar and 350°C and discharges steam at 1 bar. If the diverging portion of nozzle is 80 mm long and throat diameter is 6 mm, Determine the cone angle of the divergent portion. Assume 12% of total available enthalpy drop is lost in friction in divergent portion. Also determine the velocity and temperature of steam at throat.
9. Write short notes on following :
 - (a) Describe the phenomenon of detonation in I.C. engines. On what factors does detonation depend?
 - (b) Binary Vapour Power Cycle
 - (c) Adiabatic Saturation process and its applications.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.