PVP 14

Code: ME4T2

II B.Tech - II Semester – Regular Examinations – May 2016

APPLIED THERMODYNAMICS
(MECHANICAL ENGINEERING)

Duration: 3 hours Max. Marks: 70

PART – A

Answer ***all*** the questions. All questions carry equal marks

11x 2 = 22 M

1. a) Define adiabatic flame temperature.
   b) List the fuels used in steam power plant for combustion.
   c) Differentiate water tube and fire tube boilers.
   d) What is the basic function nozzle in steam power plants?
   e) Differentiate impulse and reaction turbines.
   f) What is compounding of a steam turbine? List various compounding methods.
   g) Give reasons why vacuum should be generated in the condenser of a steam power plant?
   h) Differentiate surface and jet condensers.
   i) Analyze the advantage of multi stage compression in case of reciprocating compressors.
   j) Identify a case where centrifugal compressors are best suited?
   k) Define isentropic and polytropic efficiencies of an axial flow compressor.

PART – B

Answer any ***THREE*** questions. All questions carry equal marks. 3 x 16 = 48 M

2. a) Thermodynamically analyze Rankine cycle. 7 M

   b) Analyze the effect of operating conditions on Rankine cycle efficiency. 9 M

3. a) Differentiate Benson boiler and locomotive boiler. 8 M

   b) Steam in a steam power plant is expanded in a set of nozzles from 10 bar, 200^0 C to 5 bar. What type of nozzle is it? Neglecting the initial velocity find minimum area of the nozzle required to allow a flow of 3 kg/s under the given conditions. Assume that expansion of steam to be isentropic. 8 M

4. a) Draw and analyze velocity diagram for De-laval turbine. 7 M

   b) The following data refers to a particular stage of parsons reaction turbine: speed of the turbine = 1500 r.p.m, mean diameter of the rotor = 1m, stage efficiency = 80%, blade outlet angle = 20^0, speed ratio = 0.7. Determine the available isentropic enthalpy drop in the stage. 9 M

5. a) Analyze the effects of air leakage in a condenser. 7 M

   b) With neat sketch explain any 2 types of surface condensers. 9 M

6. a) Explain in detail about saving of work in reciprocating compressors. 8 M

b) A centrifugal compressor receives air at the rate of 1400 m^3/min at 100 kPa and 35^0 C and delivers at 350 kPa. It has an isentropic efficiency of 82%. Mechanical losses amount to 2.5% of the shaft power. Determine the power required and exit air temperature. 8 M