Registration No. : | | | | | | | | | | |

Total number of printed pages – 2

B.Tech

PCME 4205(New)

Special Examination – 2012

ENGINEERING THERMODYNAMICS

Full Marks – 70

Time : 3 Hours

*Answer Question No. **1** which is compulsory and any **five** from the rest.*
The figures in the right-hand margin indicate marks.

1. Answer the following questions : 2×10

(a) What are the causes of entropy increase ?

(b) State the Guoy-Stodola theorem.

(c) Write down the first and second Tds equation.

(d) What are the four basic component of steam power plant ?

(e) Draw the T-s diagram of Rankine vapour cycle.

(f) What do you mean by binary vapour cycle ?

(g) Draw the Dual cycle on p-V plot.

(h) What is the need of staging the air compression process in air compressors ?

(i) What is the effect of reheat and regeneration on the work out and efficiency in case of vapour cycle ? (Mention increases or decreases only)

(j) Write down the S.F.E.E. for any flow system.

2. (a) A fluid undergoes a reversible adiabatic compression from 0.5 MPa, 0.2m^3 to 0.05 m^3 according to the law $pv^{1.3}$ = Constant. Determine the change in enthalpy, entropy and internal energy. 5

(b) Explain the folllowing terms : 5

(i) Available energy

(ii) Availability

(iii) Irreversibilty

P.T.O.

3. (a) Derive Maxwell's equations. (all **four**) 6

(b) Explain Joule-Kelvin effect. Why is it zero for an ideal gas ? 4

4. A single cylinder reciprocating compressor has a bore of 120 mm and a stroke of 150 mm, and is driven at a speed of 1200 rpm. It is compressing air from from a pressure of 120 kPa and a temperature of 20°C to a temperature of 215°C. Assuming polytropic compression with n =1.3, no clearance volume and volumetric efficiency of 100%, Calculate : 10

(a) pressure ratio

(b) indicated power

(c) shaft power, with a mechanical efficiency of 80%

(d) mass flow rate

5. Steam at 20 bar, 360°C is expanded in a steam turbine to 0.08 bar. It then enters a condenser, where it is condensed to saturated liquid water. The pump feeds back the water into the boiler.

(a) Assuming ideal processes, find per kg of steam the net work done and the cycle efficiency.

(b) If the turbine and pum have each 80% efficiency, find percentage of reduction in the net work done and cycle efficiency. 10

6. An engine working on the Otto cycle is supplied with air at 0.1 MPa, 35°C. The compression ratio is 8. Heat supplied is 2100kJ/kg. Calculate the maximum pressure and temperature of the cycle, the cycle efficiency, and the mean effective pressure. (for air, C_p =1.005, C_v = 0.718, R = 0.287 kJ/kg-K 10

7. With a neat sketch, explain vapour-absorption refrigeration cycle. 10

8. Write short notes on : 5×2

(a) Carnot and Reversed carnot cycle

(b) Bryton and Reversed Bryton cycle