BTS – V – 11.14 –0883 Reg. No. 1 5 1 1 3 0 1 4

A

B.Tech. Degree V Semester Examination November 2014

ME 504 THERMAL ENGINEERING

(*2006 Scheme*)

Time: 3 Hours Maximum Marks: 100

PART A

(Answer ***ALL*** questions)

(8 × 5 = 40)

I. (a) Explain the effect of spark advance on the performance of an Otto cycle engine.
(b) Briefly explain scavenging in IC engines.
(c) Describe octane number and cetane number.
(d) Sketch a lubrication system used in an IC engine and explain its working.
(e) Describe velocity triangle for a reaction turbine.
(f) Briefly explain effect of friction on blades.
(g) Briefly explain the combustion chambers of gas turbines.
(h) Briefly explain the working of centrifugal air compressor.

PART B

(4 × 15 = 60)

II. The pressure and temperature are 1 bar and 35 deg. C at the beginning of a cycle and its compression ratio is 10. Fix the maximum temperature at 1000 deg. C and calculate the efficiencies of Otto and Diesel cycles for these conditions. (15)

OR

III. (a) Explain Morse test. (7)
(b) Explain with sketch the valve-timing diagram of a four stroke petrol engine. (8)

IV. (a) Explain the different phases of combustion. (7)
(b) Explain the different types of cooling systems in IC engines. (8)

OR

V. Briefly explain:
(i) Alternate potential engines. (7)
(ii) How is pre ignition detected? (8)

VI. An impulse turbine has one nozzle per stage. The angle of inclination of nozzle is 22 deg. and tip angles of blades are 35 deg. If the velocity of steam at exit from the nozzle is 800 m/s, find blade speed, so that the steam shall pass on without shock. Also find the corresponding diagram efficiency. (15)

OR

VII. (a) A convergent-divergent nozzle is required to discharge 2kg of steam per second. The nozzle is supplied with steam at 6.9 bar and 180 deg.C and discharge takes place against a back pressure of 0.98 bar. Expansion up to throat is isentropic and the frictional resistance between the throat and exit is equivalent to 62.76 KJ/Kg of steam. Taking approach velocity of 75m/s and throat pressure 3.9 bar estimate the suitable areas for the throat and exit. (15)
(b) Describe aggregate planning.

VIII. (a) Briefly explain combustion intensity and combustion efficiency. (7)
(b) Compare open cycle and closed cycle gas turbine plants. (8)

OR

IX. A gas turbine unit has a pressure ratio of 6:1 and maximum cycle temperature of 600 deg.C. The isentropic efficiencies of the compressor and turbine are 0.8 and 0.82 respectively. Calculate the power output when the air enters the compressor at 15 deg.C. at the rate of 16Kg/S. Cp = 1.005 KJ/KgK, r = 1.4 for compression process and Cp = 1.11KJ/KgK, r = 1.33 for expansion process. (15)

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