2005-PUNJAB TECHNICAL UNIVERSITY

B.TECH IV SEMESTER DEGREE EXAMINATION

APPLIED THERMODYNAMICS

(MECHANICAL ENGINEERING)

TIME-3HOUR
MARK-60

Note: Section A Is Compulsory. Attempt Any Four Questions From Section B And Any Two From Section C.

SECTION A MARKS 2 EACH

1. (a) How are the internal combustion engines classified?

(b) Give merits and demerits of four stroke and two stroke systems.

(c) What is rotary displacement compressor?

(d) Briefly explain the significance of velocity vector diagram for centrifugal compressor.

(e) Name the different components of axial flow compressors.

(f) What is surging and choking?

(g) What advantage is gained by splitting the turbine section of a gas turbine into two parts, namely the compressor turbine and power turbine?

(h) Name at least three shortcomings of the gas turbines.

(i) Give he schematic arrangement of a Ramjet propulsion unit.

(j) Define propulsion efficiency.

SECTION B MARKS 5 EACH

2. Give a detailed not on I.C. Engine versus steam engine.

3. Explain the difference between an adiabatic and isentropic process.

4. A multistage axial flow compressor absorbs 6000 H.P. when delivering 20 kg/s of air from stagnation condition of 1 kgf/cm2 and 288K. If polytropic efficiency of compression is 0.9 and if the stage stagnation pressure ratio is constant, calculate pressure at compressor outlet.

5. A turbojet engine flying at a speed of 800 km/hr consumes air at the rate of 45 kg/s. Given that the enthalpy change for the nozzle is 44l5 kcal/kg and the velocity coefficient is 0.95, calculate the thermal efficiency of the plant given ? combustion is 95% and calorific value of the fuel used is 10500kcal/kg.

6. What features of the turbojet engine and the reciprocating engine are combined to give the turbo prop engine?

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SECTION C MARKS 10 EACH

7. Compare the compression ignition engine with a petrol engine of similar capacity with special reference to maximum pressure, maximum speed, power weight ratio and applications.

8. (a) Air is compressed from initial pressure of 1 bar and temperature 290 K t a pressure of 5 bar. Taking ? for air =1.4, Cp=1.00 kJ/kg K, calculate per kg of air delivered, the work expended if the compression is to be frictionless isothermal.

(b) Describe briefly the distinction between rotary compressors and the reciprocating piston compressor.

9. (a) The centrifugal compressor of a gas turbine requires 3000 H.P. when running at 16000 r.p.m. The tip diameter of the impeller is 50 cm and the uniform width of casting of he vortex chamber between impeller and diffuser is 4 cm. Measurement show that static pressure and temperature at a radius of 27 cm are 2.5 kgf/cm2 and 110 oC. The atmosphere in the test house is 1 kgf/cm2. Assuming slip factor 0.94 and neglecting friction in the vortex chamber calculate the mass flow.

(b) Describe the function of the impeller and diffuser in a centrifugal compressor.

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