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B.E. (Mechanical Engineering)
Fourth Semester
MEC-401: Applied Thermodynamics – II

Time allowed: 3 Hours

Max. Marks: 50

NOTE: *Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Unit.*

x-x-x

I.   Attempt the following:-

a)   Give comparison between reciprocating and rotary air compressors.

b)   Sketch a typical valve timing diagram of a four stroke diesel engine.

c)   What is 'Morse Test'? Why it is performed on multi cylinder 1C Engines?

d)   Briefly explain the working of turbo- inter- cooler with the help of diagram.

e)   Differentiate between adiabatic and isentropic process. Give example.   (5x2)

UNIT – I

II.   a) List out the factors affecting the flame propagation in S.I. engine & explain briefly.
      (5)

   b) Write a note on any two of the following:-

   i)   Ramjet

   ii) Turbo prop

   iii) Turbojet   (2x2½)

III.   Following data refers to an oil engine working on 4-stroke otto cycle: BP 14.7Kw. suction pressure 09 bar, mechanical efficiency 80%, compression ratio 5, index of compression curve 1.35, index of expansion curve 1.3, max explosion pressure 24 bar engine speed 1000 rpm and ratio of stroke to bore 1.5. Calculate the diameter and stroke of the piston.   (10)

IV.   The following data apply to a gas turbine cycle: Ambient temperature = 27°C, Highest cycle temperature = 827°C, Inlet pressure = 1 bar, Pressure ratio = 4, Compressor efficiency = 82 %, Turbine efficiency = 85%, Calorific value of fuel = 41 MJ/kg, Combustion Efficiency = 90%, Determine specific output, thermal efficiency and specific fuel consumption.   (10)

P.T.O.

UNIT – II

V.   a) Explain the term polytropic efficiency of compressor.

b) Describe the working of centrifugal compressor with the help of neat sketch and draw pressure velocity variation curves.   (3,7)

VI.   An axial flow compressor having eight stages and with 50% reaction design compresses air in the pressure ratio of 4:1. The air enters the compressor at 20°C and flows through it with a constant speed of 90m/s. The rotating blades of compressor rotate with a mean speed of 180m/s. Isentropic efficiency of the compressor may be taken as 82%. Calculate: work done by the machine and blade angles.   (10)

VII.   'A single stage double acting air compressor is required to deliver 14m" of air per minute measured at 1.03 bar and 15°C. The delivery pressure is 7 bar and the speed is 300rpm. Take clearance volume as 5% of the swept volume with the compression and expansion index of n = 1.3. Calculate: swept volume of the cylinder, delivery temperature and indicated power.   (10)

x-x-x