JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD
B.Tech II Year II Semester Examinations, May-2013
Applied Thermodynamics-I
(Common to ME, AME)

Time: 3 hours   Max. Marks: 75

Answer any five questions
All questions carry equal marks
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1.a) How do the specific heats vary with temperature? Explain the reasons for variation of specific heat and also discuss the influence of this on thermal efficiency of the cycle.

b) Find the percentage change in thermal efficiency of Otto cycle having a compression ratio of 12 and specific heat at constant pressure increases by 1%. [15]

2.a) How to achieve rich fuel air mixture in S.I. Engine? Under what operating conditions rich mixture is required?

b) Discuss the optimum opening position of exhaust valve to minimize the heat loss from the combustion chamber. Explain the conditions involved in it. [15]

3.a) What are different antiknock additives to be added to reduce detonation in S.I. Engine? and Explain ill effects on engine performance.

b) Differentiate between overhead valve and under head valve combustion chambers used in S.I. Engine. Explain with the help of line diagrams. [15]

4.a) What is ignition delay in combustion of C.I. Engine? How to differentiate between physical and chemical delay? Explain their influence on combustion performance.

b) How to create turbulence in C.I. Engine combustion chamber in order to get better mixing air fuel? Explain. [15]

5.a) Derive an expression for the calculation of indicated mean effective pressure.

b) A four-stroke cycle automobile engine is tested while running at 3600 rpm. Inlet air temperature is 18^0C and the pressure is 101.36 kN/m^2. The engine has eight in-line cylinders with a total piston displacement of 4000 cc. The air fuel ratio is 15 and the bsfc is 0.39 kg/kWh. Dynamometer readings show a power output of 89 kW. Find the volumetric efficiency. [15]

6.a) Derive the equation for maximum discharge in case of multi stage compression of reciprocating air compressor with perfect inter cooler.

b) A single acting two stage reciprocating air compressor with complete inter cooling delivers 8 kg/min at 16 bar pressure. Assume an intake condition of 1 bar and 15^0C and that the compression and expansion processes are polytropic with 1.35. Calculate (i) power required (ii) the isothermal efficiency. [15]

7.a) What are the required components for Vane type compressor? Explain them.

b) A single sided centrifugal compressor is to deliver 18 kg/s of air when operating at a stagnation pressure ratio of 4:1 and a speed of 220 rps. The inlet stagnation conditions may be taken as 288 K and 1.0 bar. Assuming the slip factor of 0.92 and as a power input factor of 1.04 and an overall isentropic efficiency of 0.84. Estimate the overall diameter of the impeller.   [15]

8.a) Derive the work input requirement for an axial flow air compressor and explain the salient points.

b) What is meant by work done factor? Derive its equation for the axial flow compressor.   [15]

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