

II B.Tech II Semester Examinations, APRIL 2011

THERMAL ENGINEERING-I

Common to Mechanical Engineering, Automobile Engineering

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions

All Questions carry equal marks

1. (a) Explain the details of the analytical method of performance estimation.
(b) A four-stroke cycle automobile engine is tested while running at 3600 rpm. Inlet air temperature is 16°C and the pressure is 101.36 kN/m^2 . The engine has eight in-line cylinders with a total piston displacement of 4066 cc. The air fuel ratio is 14 and the bsfc is 0.377 kg/kWh . Dynamometer readings show a power output of 86 kW. Find the volumetric efficiency. [6+10]
2. A single-sided straight vaned centrifugal compressor is required to deliver 10 kg of air per sec with a total pressure ratio of 4 : 1 when operating at a speed of 16,500 r.p.m. The air inlet pressure and temperature are 1.013 bar and 300 K. Calculate:
 - (a) Actual rise in stagnation temperature
 - (b) Tip speed of the impeller
 - (c) Tip diameter
 - (d) Inlet eye annulus area and
 - (e) Theoretical power required to drive the compressor.Take $\sigma = 0.94$, $\eta_c = 80$ percent, $c_p = 1.005 \text{ kJ/kg K}$, $\gamma = 1.4$, The air enters the eye axially with a velocity of 150 m/s. [16]
3. Determine the size of the cylinder for a double acting air compressor of 37 kW, in which air is drawn in at 1 bar and 15°C and compressed, according to the law $pV^{1.2} = \text{constant}$ to 6 bar. The compressor runs at 100 r.p.m. with average piston speed of 152.5 metres / min. Neglect clearance. [16]
4. (a) Is the effect of compression ratio on efficiency as same in fuel-air also? Explain.
(b) Explain with the help of p-v diagram the loss due to variation of specific heats in Otto cycle? [8+8]
5. (a) Discuss the effect of turbulence and compression ratio on the combustion characteristics in S.I. Engine.
(b) What is the instrument used for the measurement of knocking? Explain the influence of operating parameters on knocking in S.I.Engine. [8+8]
6. (a) Discuss the relative merits and demerits and fields of applications of vapour absorption and vapour compression refrigeration systems.
(b) What modifications are necessary in a simple absorption refrigeration system in order to improve the performance of the system. [16]

Code No: R05220304

R05

Set No. 2

7. An air-conditioned space is maintained at 27°C DBT and 50 percent RH. The ambient conditions are 40°C DBT and 27°C WBT. The space has a sensible heat gain of 14 kW. Air is supplied to the space at 7°C saturated. Calculate.
- (a) Mass of moist air supplied to the space in kg/h;
 - (b) Latent heat gain of space in kW;
 - (c) Cooling load of air washer in kW if 30 percent of the air supplied to the space is fresh, the remainder being recirculated? [16]
8. (a) What is meant by surface volume ratio of combustion chambers in C.I. Engines and how does it influence the starting capacity of the engine?
- (b) List out the advantages and disadvantages of turbulent combustion chambers over non- turbulent type. [8+8]

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