

COLLEGE OF ENGINEERING PUNE
Department of Mechanical Engineering.

END SEM EXAM

Subject: ETHT (Production)

Semester: Spring 2011

Duration: 3hrs.

Max Marks: 50.

Instructions:

- 1) All questions are compulsory.
- 2) Figures to right indicate full marks.
- 3) Wherever necessary support your answers with neat labeled diagrams.
- 4) Assume suitable data where ever necessary. Mention those assumptions clearly.

BEST OF LUCK

- | | | Marks |
|----|---|-------|
| Q1 | a | 05 |
| | What is the final condition of the steam in each of the following process, if the initial condition in each case is 0.95 dry and pressure is 8.6 bar. | |
| | i) This steam loses 146kJ/kg at constant pressure. | |
| | ii) Its temperature is reduced at constant volume to 65 ⁰ C. | |
| | b | 05 |
| | Write a note on excess air .How do you calculate the weight of carbon in flue gas? | |
| | OR | |
| | b | 05 |
| | Classify Fuels. State the limitation of individual types. Discuss at least two fuels in detail. | |
| Q2 | a | 05 |
| | In an impulse turbine the mean diameter of the blade is 1.05m and the speed is 3000 rpm. The nozzle angle is 18 ⁰ , the ratio of blade speed to steam speed is 0.42 and the ratio of relative velocity at the out let from the blade to that at inlet is 0.84. The out let angle of the blade is to be made 3 ⁰ less than the inlet angle. The steam flow is 10kg/s,draw the velocity diagram of the blade and find the following : | |
| | i) Tangential thrust on the blades. ii) Axial thrust on the blade. | |
| | ii) Resultant thrust on the blade. iii) Power developed on the blade. | |
| | b | 05 |
| | In a Rankine cycle ,the steam at inlet to the turbine is saturated at pressure of 35 bar and the exhaust pressure is 0.2 bar .Determine | |
| | i) Pump work. ii) Turbine work. iii) Rankine efficiency. iv) Condenser heat flow. v) Dryness at the end of expansion | |
| Q3 | a | 05 |
| | Classify various types of energy in conventional and non-conventional sources of energy. With neat diagram write a short note on biogas plant | |
| | b | 05 |
| | With neat sketch explain construction and working of Geothermal power plant. | |
| Q4 | a | 05 |
| | Derive an expression for efficiency of Diesel cycle in terms of the cutoff ratio, compression ratio and the adiabatic index. | |
| | OR | |
| | a | 05 |
| | For a given compression ratio, whose efficiency will be more Diesel or Otto cycle? Prove it. | |
| | b | 05 |
| | A four stroke engine operating on Otto cycle has a swept volume of 0.1 m ³ .The compression ratio is 7. The condition at the start of cycle; pressure 0.1MPa and the temperature 90 ⁰ C. The heat addition at constant volume is 100kJ/cycle.Find the Ideal efficiency, mean effective pressure and temperature at key points in the cycle. Assume air as working substance with C _v =0.718kJ/kg ⁰ k and γ=1.4. | |
| Q5 | a | 05 |
| | An industrial freezer is designed to operate with an internal air temperature of -20 ⁰ C, when the external air temperature is 25 ⁰ C .The internal and external heat transfer coefficients are 12 W/m ² K and 8 W/m ² K respectively. The wall of the freezer consists inner layers of plastic (k=1W/m K), 3mm thick and outer layer of stainless steel (k=16 W/mK), 1mm thick. A layer of Insulation material (k=0.07W/m K) is sandwiched between these two layers. Find the thickness of this insulation required to reduce the convective heat loss to 15W/m ² | |
| | b | 05 |
| | With neat sketches Classify and explain various types Heat Exchangers. | |
| | OR | |
| | b | 05 |
| | Write a short note on Critical thickness of Insulation | |