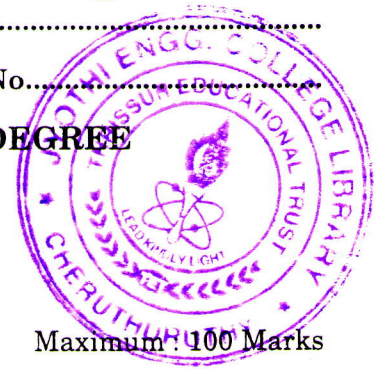


**THIRD SEMESTER B.TECH. (ENGINEERING) DEGREE
EXAMINATION, DECEMBER 2007**

Electrical and Electronics Engineering
EE/PT 2K 303—MECHANICAL ENGINEERING—I



Time : Three Hours

Maximum : 100 Marks

Answer all questions.

- I. (a) Prove that Internal energy is a property.
 (b) A heat engine receives 900kJ of heat from high temperature source at 900°C during a cycle. The work developed by this engine is 300 kJ and the remaining energy is rejected as heat to a sink at 35°C. Check the validity of this engine on the basis of Carnot theorem.
 (c) What is the basic air standard cycle used for petrol engine ? Calculate the number of sparks per minute produced by the spark plug of a four-stroke single cylinder petrol engine running at 3000 rpm ?
 (d) Explain the Brayton cycle with p-V and T-s plots.
 (e) Classify steam generators based on various methods.
 (f) Describe different types of Dams.
 (g) What are the two main types of steam turbine ? Compare these types.
 (h) Describe about velocity compounding of an impulse turbine.

(8 × 5 = 40 marks)

- II. (a) Write both the statements of II law and prove their equivalence.

Or

- (b) (i) 0.112 m³ of gas has a pressure of 138 kPa. It is compressed to 690 kPa according to the law $pV^{1.4} = \text{Constant}$. Determine final volume of the gas and work done on the gas.
 (ii) Air enters a centrifugal compressor at 1.05 bar and 15°C and leaves at 2 bar and 97°C. The mass flow rate is 50 kg/min. Find out the power required to drive the compressor. Take C_p of air as 1.005 kJ/kgK.

(8 marks)

- III. (a) The compression ratio in an air-standard Otto cycle is 8. At the beginning of the compression stroke the pressure is 0.1 Mpa and the temperature is 15°C. The heat transfer to the air per cycle is 1800 kJ/kg of air. Determine the following.

- (i) The pressure and temperature at the end of each process of the cycle.
 (ii) The thermal efficiency.
 (iii) The mean effective pressure.

Or



Turn over

- (b) Explain the principle of operation of two-stroke engine, which uses spark plug for ignition with neat sketches.
- IV. (a) (i) What are the requirements for a good boiler ? (8 marks)
(ii) What are the advantages of water tube boiler compared to fire tube boiler ? (7 marks)

Or

- (b) What are the components used in steam power plant ? Write in detail the function of each component. Draw the schematic sketch of the power plant.
- V. (a) Explain the principle of operation of rotary air compressor.

Or

- (b) The following data relates to a single stage impulse turbine :—

Steam velocity = 600 m/s :

Blade speed = 250 m/s.

Nozzle angle = 20°

Blade outlet angle = 25°

Steam flow rate = 20 kg/s

Calculate the work developed by the turbine and axial thrust on the bearings neglecting the effect of friction.

(4 × 15 = 60 marks)

