D 26588 (Pages : 2) Name.....

Reg. No.....

COMBINED FIRST AND SECOND SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, DECEMBER 2006

EE 04 108—MECHANICAL ENGINEERING—I

(2004 admissions)

Time : Three Hours Maximum : 100 Marks

Answer **all** *questions.*

Part A

Each question carries 5 *marks.*

I. 1 What is meant by concept of continuum and control volume ?

2 What is meant by Zeroth law of thermodynamics ?

3 Define second law of thermodynamics.

4 Explain various criterion for classification of IC engine.

5 Explain various processes involved in Carnot cycle.

6 What is meant by air standard and vapour power cycles ?

7 What are the advantages and disadvantages of diesel power plants ?

8 What is meant by tidal power ?

(8 × 5 = 40 marks)

Part B

II. 1 Air flows steadily at the rate of 0·5 kg./s through air compressor, entering at 7 m/s velocity, 100 kPa pressure, 0·95 kg./m.^{3} volume and leaving at 5 m/s, 700 kPa and 0·19 m.^{3}/kg. Internal energy of air leaving is 90 kJ/kg. greater than that of air entering. Cooling water in compressor absorbs heat from air at the rate of 58 kW. Determine work input to compressor.

Or

2 A mass of gas 1·5 kg., undergoes expansion process according to relation P = a + bV, where a and b are constants. The initial and final pressures are 1000 kPa and 200 kPa respectively and corresponding volumes are 0·2 m.^{3} and 1·2 m.^{3} The specific internal energy of gas is given by relation

$$u = 1{\cdot}5\ pv - 85 \text{ kJ/kg.},$$

where p is in kPa and v is in m.^{3}/kg. Calculate heat transferred and internal energy attained.

3 Derive an expression for thermal efficiency of Carnot cycle and state its limitation to be applied as a practical cycle.

Or

4 Explain with a neat sketch working of 2-stroke engine.

Turn over

5 An engine working on Otto cycle is supplied with air at 0·1 MPa, 35° C. The compression ratio is 8. Heat supplied is 2100 kJ/kg. Calculate the maximum pressure and temperature of cycle, the cycle efficiency. Take $\gamma = 1{\cdot}4$, R = 287 J/kg. K.

Or

6 With a simple figure, explain the working of Rankine cycle.

7 Explain with a neat sketch working of hydel power plants.

Or

8 Write short notes on various parts of a nuclear reactor.

(4 × 15 = 60 marks)