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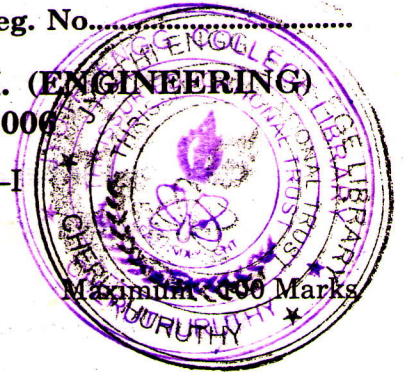
Reg. No.....

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

EE 04 108—MECHANICAL ENGINEERING—I

(2004 admissions)

Time : Three Hours



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.<sup>3</sup> volume and leaving at 5 m/s, 700 kPa and 0.19 m.<sup>3</sup>/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.<sup>3</sup> and 1.2 m.<sup>3</sup> The specific internal energy of gas is given by relation

$$u = 1.5 pv - 85 \text{ kJ/kg.}$$

where  $p$  is in kPa and  $v$  is in m.<sup>3</sup>/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  $\gamma = 1.4$ ,  $R = 287$  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)