Code No. : 5180/O

FACULTY OF ENGINEERING
B.E. 2/4 (M/P) II Semester (Old) Examination, May/June 2012
THERMODYNAMICS

Time : 3 Hours] [Max. Marks :75

***Note** : Answer **all** questions from Part **A**. Answer **any five** questions from Part **B**.*

PART – A **(Marks 25)**

1. Distinguish between intensive and extensive properties.
2. What is thermodynamic equilibrium ?
3. Mention various types of work transfer.
4. Define PMM1.
5. Define heat engine.
6. What is available and unavailable energy ?
7. Explain the critical state of a substance.
8. What are the uses of a Mollier diagram in steam calculations ?
9. Draw the Otto cycle on P-V and T-ϕ diagrams.
10. State the difference between high calorific value and low calorific value.

PART – B **(Marks 50)**

11. a) Write about ideal gas temperature scale. **5**

    b) A mass of 1.5 kg of air is compressed in a quasi static process from 0.1MPa to 0.7 MPa for which pv = constant. The initial density of air is 1.16 kg/m^3. Find the work done by the piston to compress the air. **5**

12. a) Apply SFEE to a nozzle. **3**

    b) Air at 4 bar and 80°C flows into a small turbine at a velocity of 40 m/s. The air leaves the turbine at 1.5 bar and 10°C with a velocity of 125 m/s. If the shaft work delivered by the turbine is 65 kJ/kg air, what is the heat transfer per kg of air flowing ? **7**

13. A heat engine receives 400 kJ heat reversibly from a source at 327°C and rejects heat reversibly to the sink at 27°C. There are no other heat transfers find out whether the engine is reversible, irreversible or impossible for the following heat rejections
    i) 300 kJ
    ii) 200 kJ
    iii) 100 kJ **10**

14. Two kg of water at 80°C are mixed adiabatically with 3 kg of water at 30°C in a constant pressure process of 1 atmosphere. Find the increase in entropy of total mass of water due to the mixing process. **10**

15. a) Explain the behaviour of water as a pure substance with the help of a P-T diagram. **4**
    b) Derive the Clapyron equation and explain its application. **6**

16. A fuel consists of the following % analysis by mass : Carbon : 84%; hydrogen 10%; oxygen 2%, sulphur : 1% and nitrogen 3%. Find the amount of air required to completely burn 1kg of this fuel and determine the products of combustion both by mass and as a percentage. **10**

17. The compression ratio of dual cycle is 10. The temperature and pressure at the beginning of the cycle are 1 bar and 27°C. The maximum pressure of the cycle is limited to 70 bar and heat supplied is limited to 675 kJ/kg of air. Find thermal efficiency of the cycle. **10**
