



**MAR IVANIOS COLLEGE (AUTONOMOUS)**  
**THIRUVANANTHAPURAM**

Reg. No. :.....

Name :.....

**Second Semester B.Sc. Degree Examination, June 2016**  
**First Degree Programme under CBCSS**  
**Complementary Course: Physics – II (for Mathematics)**  
**AUPY231.2c: Heat and Thermodynamics**

Time: 3 Hours

Max. Marks: 80

**SECTION – A**

*Answer ALL questions in a word or one or two sentences.*

1. The unit of thermal conductivity is \_\_\_\_\_.
2. Define thermal diffusivity.
3. State Wiedemann Franz law.
4. State Wien's displacement law.
5. Define an adiabatic process.
6. What is a heat engine ?
7. State second law of thermodynamics.
8. Give an expression for efficiency of a heat engine.
9. State the principle of increase of entropy.
10. Define the concept of change in entropy.

**(10 × 1 = 10 Marks)**

**SECTION – B**

*Answer any EIGHT questions, not exceeding a paragraph.*

11. Explain distribution of energy in solar spectrum.
12. Describe the failure of Wien's law in explaining black body spectrum.
13. Explain the determination of temperature of sun using the idea of solar constant.
14. Obtain an expression for work done during an isothermal process.

P.T.O.

**1399**

15. Obtain the expressions for isothermal elasticity and adiabatic elasticity.
16. What is a Carnot's heat engine ? Explain its essential parts.
17. Distinguish between petrol and diesel engines.
18. Explain change in entropy during reversible and irreversible thermodynamic processes.
19. Discuss the relation between entropy and disorder.
20. Draw the TS diagram for a Carnot's cycle and show that its area represents work done.
21. Obtain an expression for change in entropy when ice at  $0^{\circ}\text{C}$  is converted to steam at  $100^{\circ}\text{C}$ .
22. Obtain an expression for heat conducted by a body and hence define thermal conductivity.

**(8 × 2 = 16 Marks)**

### **SECTION – C**

*Short essay type / Problems : Answer any **SIX** questions.*

23. The opposite faces of a metal plate of 0.2 cm thickness are at a difference of temperature of  $100^{\circ}\text{C}$  and area of the plate is  $200\text{ cm}^2$ . Find the quantity of heat that will flow through the plate in one minute. ( $K = 0.2$  cgs units).
24. Calculate surface temperature of moon. Given the wave length of maximum intensity of radiation emitted by moon is  $14\ \mu\text{m}$ .
25. A motor car tyre has a pressure of 2 atm at  $27^{\circ}\text{C}$ . If the tyre suddenly bursts, find the resulting temperature.
26. A Carnot's engine working between  $127^{\circ}\text{C}$  and  $27^{\circ}\text{C}$  absorbs 8000 J of heat. Find the amount of heat rejected to sink.
27. Calculate the work done when a gram molecule of an ideal gas expands isothermally at  $27^{\circ}\text{C}$  to double its original volume.
28. A petrol engine using ideal air as working substance has its compression ratio raised from 5 to 6. Find the % increase in efficiency.
29. Calculate the change in entropy when 10 gram ice at  $0^{\circ}\text{C}$  is converted to water at same temperature. Given  $L_f$  of ice is  $336000\text{ J/Kg}$ .

30. Calculate the change in entropy when 10 gram of water at  $0^{\circ}\text{C}$  is converted to water at  $100^{\circ}\text{C}$ .
31. Thermal conductivity of brass is 4 times that of copper. Two bars one of brass and other of copper of same length and same area of cross section are joined together. The free ends of copper and brass are kept at  $0^{\circ}\text{C}$  and  $100^{\circ}\text{C}$  respectively. Find the temperature of the joint in the case of steady state neglecting radiation losses.

(6 × 4 = 24 Marks)

### SECTION – D

*Long essay type : Answer any TWO questions.*

32. Explain Lee's disc method to find thermal conductivity of a bad thermal conductor.
33. Explain distribution of energy in a black body and explain Wien's, Rayleigh – Jean's and Planck's explanation of the spectrum.
34. Describe the construction and working of a diesel engine and hence obtain an equation for its efficiency.
35. Explain Carnot's cycle and deduce an equation for efficiency of an ideal heat engine.

(2 × 15 = 30 Marks)

\*\*\*\*\*