(Pages : 4) **G – 2407**

Reg. No. : .....

Name : .....

Second Semester B.Sc. Degree Examination, May 2019

First Degree Programme under CBCSS

Complementary Course

PY 1231.1 HEAT AND THERMODYNAMICS

(For Mathematics)

(2013-2017 Admissions)

Time : 3 Hours Max. Marks : 80

PART – A

Answer **all** questions. Answer should not exceed two sentences.

Each question carries 1 mark.

1. Explain the temperature dependence of black body radiation.
2. Define Weidmann and Franz law.
3. Explain the term emissive power of a body.
4. State Planck's radiation law.
5. What is the first law of thermodynamics? Give its limitations.
6. Mention the effective ways to increase Carnot's engine efficiency.
7. What do you meant by quasi-static process?

P.T.O.

8. Define the term entropy.

9. Explain change of entropy in adiabatic process.

10. Explain the concept of available energy and entropy.

(10 × 1 = 10 Marks)

PART – B

Answer **any eight** questions. Answer should not exceed one small paragraph. Each question carries 2 marks.

11. Define coefficient of thermal conductivity. What are its dimensions?

12. Give the Planck's quantum postulates.

13. What is the effect of temperature on thermal conductivity?

14. Define the term solar constant.

15. Discuss the term isothermal process.

16. Derive the equation for adiabatic elasticity.

17. Show that the slope of an adiabatic is γ times the slope of the isothermal.

18. What is the Plank's statement of second law thermodynamics?

19. What is T-S diagram? What is importance of T-S diagram?

20. Obtain an expression for the change in entropy when ice changes into steam.

21. State the principle of increase of entropy.

22. What is an indicator diagram? State its importance.

(8 × 2 = 16 Marks)

PART – C

Answer **any six** questions. Each question carries 4 marks.

23. Two plates of the same dimensions but of different thermal conductivities K_1 and K_2 are welded together to form a single plate of double thickness. Show that the equivalent thermal conductivity K is given by $K = \frac{2K_1 K_2}{K_1 + K_2}$.

24. What is the wavelength at which human body radiates maximum energy? Given $b=2.898X10^{-3}$ mK temperature of human body is 37 °C.

25. Calculate the black body temperature of the sun. Given that Stefan's constant is 1.37×10^{-12} cal/cm^2/s. Solar constant is 2.3 cal/cm^2/minute radius of the sun is 3.5×10^{10} cm. Distance between the sun and the earth is 1×10^{13} cm.

26. A Carnot's engine whose temperature of the source is 200K takes 100 calorie of heat at this temperature and rejects 75 calorie of heat to the sink. What is the temperature of the sink? Calculate the efficiency of the engine.

27. Calculate the change in entropy when 10 kg of water at 150°C is converted into steam at the same temperature. Given Latent heat of steam = 540 cal/gram.

28. Efficiency of a Carnot's cycle change from 1/6 to 1/3 when source temperture is raised by 100K. Calculate the temperture of the sink.

29. State and explain Rayleigh-Jeans law.

30. Show that there is always an increase of entropy in an irreversible cycle.

31. Deduce the expression for work done during adiabatic processes.

(6 × 4 = 24 Marks)

PART – D

Answer **any two** questions. Each question carries 15 marks.

32. With necessary theory explain how thermal conductivity of a bad conductor is determined by Lee's disc method.

33. (a) Discuss the distribution of energy in the spectrum of black body on the basis of the spectrum.

    (b) Deduce Wien's displacement law for the distribution of energy in black body spectrum.

34. Describe with necessary theory, the construction and working of an Otto engine. Deduce the efficiency of an Otto engine in terms of the temperature between which it works.

35. Calculate the work done in a Carnot's Cycle of operations. Deduce the efficiency of a Carnot's engine in terms of the temperatures between which it works.

(2 × 15 = 30 Marks)