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Reg. No. : .....

Name : .....

Third Semester B.Sc. Degree Examination, January 2019
First Degree Programme under CBCSS
PHYSICS
Core Course
PY 1341 : Thermodynamics and Statistical Physics
(2013 Admission Onwards)

Time : 3 Hours Max. Marks : 80

PART – A

Answer **all** questions. Answer should **not** exceed **two** sentences. **Each** question carries **1** mark.

1. Define Solar Constant.
2. Explain the term Coefficient of thermal conductivity.
3. State Zeroth law of thermodynamics.
4. What is a quasistatic process ?
5. What is meant by a perfect black body ?
6. Define the term entropy.
7. Write down Clausius inequality theorem.
8. State the Principle of increase of entropy.
9. State and explain Liouville's theorem.
10. Explain the term thermodynamic probability.

PART – B

Answer **any 8** questions. Answer should **not** exceed **one small** paragraph. **Each** question carries **2** marks.

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

12. Derive an expression for thermal conductivity considering radial flow of heat.

13. Discuss Lee's disc method for finding the coefficient of thermal conductivity for bad conductors.

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

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

16. Mention the effective ways to increase Carnot's engine efficiency.

17. Draw and explain the labeled indicator diagram for Diesel engine.

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

19. Define and explain the terms Macrostate and Microstate with the help of an example.

20. Write a short note on Fermi-Dirac energy distribution function.

21. Derive Clausius – Clapeyron's Equation.

22. Define the Gibbs Potential function and show that for simultaneous isobaric and isothermal process, Gibbs free energy remains constant.

PART – C

Answer **any 6** questions. **Each** question carries **4** marks.

23. The opposite faces of a metal plate of 0.2 cm thickness are at a difference of temperature of 100°C and the area of the plate is 200 sq. cm. Find the quantity of heat that will flow through the plate in one minute if, K = 0.2 CGS units.

24. 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 $K = \frac{2K_1K_2}{K_1 + K_2}$.

25. Calculate the radiant emittance of a black body at a temperature of (i) 4000K (ii) 4000K. Given $\sigma = 5.672 \times 10^{-8}$ M.K.S. units.

26. Calculate the surface temperature of sun and moon if the wavelength corresponding to the maximum intensity of radiations from them are 4753 A^0 and 14 μm respectively. (Wien's constant b = .2898)

27. Find the efficiency of the Carnot's engine working between the steam point and the ice point.

28. Calculate the probability that in tossing a coin 5 times, we get 3 heads and 2 tails.

29. Calculate the value of Fermi-energy at absolute zero temperature.

30. 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.

31. Calculate the work done when a gram molecule of an ideal gas expands isothermally at 50°C to double its original volume. Given R = 8.3 J/deg mole.

PART – D

Answer **any 2** 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. Deduce the Maxwell's thermo dynamical relations and mention any two of its applications.

34. Describe with necessary theory, the construction and working of an Otto engine. Deduce the efficiency of an Otto engine in terms of the temperatures 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.