R – 3112

Reg. No. : ....

Name : ....

Second Semester B.Sc. Degree Examination, September 2023

First Degree Programme under CBCSS

Physics

Core Course

PY 1241 : HEAT AND THERMODYNAMICS

(2018 Admission Onwards)

Time : 3 Hours

Max. Marks : 80

SECTION – A

Answer **all** questions in a word or sentence, each carries **1** mark.

1. State Wiedemann-Franz law.

2. Define coefficient of thermal conductivity.

3. State the working principle of refrigerator.

4. What is an indicator diagram?

5. Give two demerits of Diesel engine.

6. Give the principle of pressure cooker.

7. How entropy is related to disorder.

8. State Wien's displacement law.

9. Explain first order phase transition.

10. What is Lambda point?

(10 × 1 = 10 Marks)

P.T.O.

SECTION – B

Answer any **eight** questions in **two** or **three** sentences. Each carries **2** marks.

11. Distinguish between isothermal and adiabatic processes.

12. State and explain zeroth law of thermodynamics.

13. Draw the experimental set up for determining Stefan's constant.

14. Represent Carnot's Cycle on a TS diagram.

15. Cooking utensils are provided with wooden handles. Why?

16. Compare Otto engine and Diesel engine in terms of efficiency.

17. Distinguish between reversible and irreversible process.

18. Show that adiabatic elasticity is γ times isothermal elasticity.

19. Obtain Mayer's relation as an application of first law of thermodynamics.

20. Explain the effect of pressure on the melting point of a substance.

21. Name the various strokes of an otto engine.

22. Explain thermometric conductivity.

<div align="right">(8 × 2 = 16 Marks)</div>

SECTION – C

(Problem – write all relevant formulae)

Answer any **six** questions, each carries **4** marks.

23. A brass boiler has a base area 0.15 m^2 and thickness 1 cm. It boils water at the rate of 6 Kg/mm when placed on a gas stove. Estimate the temperature of the part of the flame in contact with the boiler. K for brass = 109 JS^{-1}m^{-1}K^{-1}. Latent heat of vaporisation of water = 2256 Jg^{-1}.

24. A body at 1500K emits maximum energy of wavelength 20000A°. If the sun emits maximum energy of wavelength 5500 A°. what would be the temperature of the sun?

25. Calculate the wavelength and frequency of a quantum of radiation of energy 1.65×10^{-18} J, h = 6.6×10^{-34} J.S. Velocity of light = 3×10^8 ms^{-1}.

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26. A quantity of air of 27°C and atmospheric pressure is suddenly compressed to half its original volume. Find the final pressure and temperature. ($\gamma = 1.4$).

27. One mole of a gas at 27°C expands isothermally until its volume is doubled. Calculate the work done. ($\gamma = 1.4$).

28. A Carnot engine working between two temperatures has efficiency 0.2. When the temperature of the source is increased by 25°C, the efficiency increases to 0.25. Find the temperature of the source and sink.

29. Calculate the increase in entropy when 2 Kg of water at 100°C is converted to steam at the same temperature. Given latent heal of steam = 2.268×10^6 J/Kg.

30. Find the efficiency of a Carnot engine working between 127°C and 27°C.

31. A sample of gas expands isothermally to 5 times initial volume. Calculate the change in entropy in terms of the gas constant.

(6 × 4 = 24 Marks)

SECTION – D

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

32. Describe an experiment to determine the thermal conductivity of poor conductors by Lee's disc method.

33. Define solar constant. Describe an experiment to determine solar constant.

34. Describe with diagram the working of an Otto engine and derive an expression for its efficiency.

35. Calculate the total change in entropy when unit mass of ice at 0°C is converted into steam at 100°C.

(2 × 15 = 30 Marks)

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