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Second Semester B.Sc. Degree Examination, August 2024

First Degree Programme under CBCSS

Physics

Core Course

PY 1241 : HEAT AND THERMODYNAMICS

(2023 Admission)

Time : 3 Hours Max. Marks : 80

SECTION – A

Answer **all** questions.

1. What is radial flow of heat?
2. Why the woollen cloths keep the body warm in winter?
3. State Stefan's law.
4. What is meant by black body radiation?
5. State the Clausius statement.
6. Define latent heat.
7. State the zeroth law of thermodynamics.
8. Why the entropy of a system is a state function?
9. State Nernst theorem.
10. What is first order phase transition?

(10 × 1 = 10 Marks)

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SECTION – B

Answer any **eight** questions.

11. Explain thermal conductivity and its SI units.
12. What is Weidmann and Franz law?
13. Outline the important features of black body spectrum.
14. Explain Plank's law of radiation.
15. Distinguish between isothermal and adiabatic change.
16. Show that adiabatic curve is steeper than isothermal curve.
17. State and explain Carnot' s theorem.
18. Explain first law of thermodynamics and write it in differential form.
19. Draw the labelled indicator diagram for Carnot' s engine cycle.
20. Discuss the entropy and disorder.
21. State the third law of thermodynamics.
22. What is second order phase transition? Give examples.

(8 × 2 = 16 Marks)

SECTION – C

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°c. The area of the plate is 200 sq.cm . Find the quantity of heat that flows through the plate in one minute, assuming k = 0.2 CGS units.
24. Obtain an expression for work done in isothermal and adiabatic process.
25. Find the efficiency of the Carnot's engine working between the steam point and the ice point.
26. Define solar constant. Determine the solar temperature.

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27. Air is compressed adiabatically to half its volume. Calculate the change in its temperature.

28. A carnot's engine working as a refrigerator between 260K and 300K receives 500 calories of heat from the reservoir at the lower temperature. Calculate the amount of heat rejected to the reservoir at the higher temperature. Also calculate the amount of work done in each cycle to operate the refrigerator.

29. Calculate the change in entropy when 5kg of water at 100°c is converted in to steam at the same temperature.

30. Prove the Clausius inequality $\sum_i \frac{Q_i}{T_i} \leq 0$.

31. The compression ratio of a diesel engine is 15 to 1. If the initial temperature is 1.01×10^5 Pa and the initial temperature is 27°c. Find the final pressure and temperature after compression. Given $\gamma = 1.4$.

(6 × 4 = 24 Marks)

SECTION – D

Answer any **two** questions.

32. (a) Discuss the cylindrical flow of heat.

    (b) Describe the experiment to determine the coefficient of thermal conductivity of rubber.

33. Describe with necessary theory, the construction and working of a Otto engine. Deduce an expression for its efficiency.

34. Discuss in detail the change of entropy for a

    (a) Reversible process and

    (b) Irreversible process.

35. Explain the principle and working of refrigerator and obtain an expression for its efficiency.

(2 × 15 = 30 Marks)

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