



Reg. No. :

Name :

Second Semester B.Sc. Degree Examination, July 2017
First Degree Programme Under CBCSS
Complementary for Mathematics
PY 1231.1 : HEAT AND THERMODYNAMICS

Time : 3 Hours

Max. Marks : 80

SECTION – A

Answer **all** questions on **one** or **two** sentences. **Each** question carries **one** mark.

1. What is the principle of increase of entropy ?
2. State Weidmann Franz law.
3. What is solar constant ?
4. What is meant by a black body ?
5. What do you mean by entropy ?
6. What is the Kelvins statement of the second law of thermodynamics ?
7. What is an isothermal process ?
8. What is the basic concept in the Plancks law of black body radiation ?
9. Dark coloured clothes are preferred in winter. Why ?
10. Distinguish between heat engine and refrigerator. (10×1=10 Marks)

SECTION – B

Answer **any eight** questions, **not** exceeding a paragraph. **Each** question carries **two** marks.

11. What do you mean by a thermodynamic system ?
12. Distinguish between reversible and irreversible process.



13. What are the different parts of a heat engine ?
14. Explain Carnot's theorem.
15. Distinguish between isochoric and isobaric process.
16. What is isothermal elasticity ?
17. What is the merit of a diesel engine over otto engine ?
18. Explain the concept of entropy and disorder.
19. Explain Rayleigh-Jeans law.
20. Explain why an adiabatic process is called an isentropic process.
21. What is an indicator diagram ? What is its importance ?
22. Entropy of an irreversible process always increases. Why ?

(8×2=16 Marks)

SECTION - C

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

23. Calculate the black body temperature of the Sun from the following data.
Stefans constant = $1.37 \times 10^{-12} \text{ cal/cm}^2/\text{s}$
Solar constant = $2.3 \text{ cal/cm}^2/\text{minute}$
Radius of Sun = $7 \times 10^{10} \text{ cm}$
Distance between Sun and Earth = $1.5 \times 10^{13} \text{ cm}$.
24. Calculate the increase in entropy of 10kg of water at 100°C , when it changes to vapour. Given the latent heat of steam = $2.26 \times 10^6 \text{ J/Kg}$.
25. Calculate the radiant emittance of a black body at 400 K. ($\sigma = 5.672 \times 10^{-8} \text{ J/m}^2/\text{s}$).
26. An ice box is built of wood 1.75 cm thick and lined inside with cork of 3 cm thickness. If the temperature of the inner surface of the cork is 0°C and that of the outer surface of the wood is 12°C , what is the temperature of the interface. Given, the thermal conductivity of wood is 0.0006 and that of cork is 0.00012.
27. Calculate the energy radiated per minute from the filament of an incandescent lamp at 2000 K. Given, the surface area of filament is $5.0 \times 10^{-5} \text{ m}^2$, relative emittance = 0.85 and $\sigma = 5.672 \times 10^{-8} \text{ J/m}^2/\text{s}$.



28. One mole of a gas is isothermally expanded at 27°C , till the volume is doubled. Calculate the work done.
29. A carnot engine is made to work between 200°C and 0°C first and then between 0°C and -200°C . Compare the efficiencies and comment on it.
30. If one mole of a gas is expended isothermally to four times its initial volume, calculate the increase in entropy. Given $R = 8.314 \text{ J/mol/K}$.
31. A carnot engine is working between 300°C and 1000°C . Calculate the increase in efficiency if the temperature of the source is raised by 200°C (6×4=24 Marks)

SECTION - D

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

32. What is quantum theory of radiation ? Explain Planck's law for the distribution of energy in the spectrum of black body and hence discuss the Wiens displacement law and Rayleigh-Jeans law.
33. Define coefficient of thermal conductivity. Describe the Lee's disc method for the determination of the thermal conductivity of a bad conductor.
34. State and explain second law of thermodynamics. Describe Carnot's cycle and deduce the efficiency of an ideal heat engine.
35. Discuss with necessary theory, the working of an otto engine and hence derive its efficiency. (2×15=30 Marks)
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