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Second Semester B.Sc. Degree Examination, May 2020

First Degree Programme under CBCSS

Complementary Course for Mathematics

PY 1231.1 : HEAT AND THERMODYNAMICS

(2013 – 2017 Admission)

Time : 3 Hours

Max. Marks : 80

SECTION – A

Answer **all** questions. Each

9. What is conduction?

10. What is an isothermal process?

(10 × 1 = 10 Marks)

SECTION – B

Answer any **eight** questions. Each question carries **2** marks.

11. What is a T-S diagram? Draw the T-S diagram or Carnot cycle.

12. Show that the entropy change of the universe is zero for a reversible process.

13. State Rayleigh- Jeans law. What are the failures?

14. Draw the indicator diagram for a diesel engine and name the different processes.

15. Show that the slope of adiabatic curve is steeper than isothermal curve.

16. Derive the expression for work done in an isothermal process.

17. State and explain the principle of increase of entropy.

18. State Kirchhoff's law. What are the applications?

19. Prove that for an isothermal process the isothermal elasticity is the pressure itself.

20. What is an indicator diagram. What is its significance?

21. What is an isentropic process? Show that adiabatic processes arc isentropic.

22. Obtain the relation for coefficient of thermal conductivity? Find out its dimension.

(8 × 2 = 16 Marks)

SECTION – C

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

23. Calculate the change in entropy when 5kg of water at 100^0C is converted into steam at the same temperature. Latent heat of steam is 540*cal/gram*. $(1cal/gm = 4.2\times10^3 J)$

24. A Carnot engine whose source temperature is at 100^0C takes 4200*J* of heat and gives out 2800*J* to the sink. Find the temperature of the sink.

25. A quantity of air at *30°C* and one atmospheric pressure is suddenly compressed to half of its original volume. Find the final pressure and temperature. $\gamma = 1.4 (1atm = 1.013\times10^5 Pa)$.

26. The efficiency of a Carnot engine changes from 1/6 to 1/3 When the source temperature is raised by 100K. Calculate the temperature of the sink.

27. A both at 1500K emits maximum energy of wavelength 1800nm. If the sun emits maximum energy of wavelength 500nm, what would be the temperature of the sun?

28. Prove the $PV^\gamma = a$ constant for an adiabatic process.

29. Calculate the black body temperature of the sun, given solar constant is $2.3cal/cm^2/$ minute, radius of the sun is $7\times10^5 Km$, distance between earth and sun is $1.5\times10^7 Km$ and Stefan's constant is 5.672×10^{-8} SI Units.

30. Deduce the temperature at which a black body losses thermal energy at the rate of 1 *watt/cm*^{2} ? Stephan's constant is 5.672×10^{-8} SI Units.

31. Calculate the workdone when 1 mole of a monoatomic gas at 0°C is compressed adiabatically half its volume. $(R = 8.314 J/mol.K, \gamma = 1.67)$.

(6 × 4 = 24 Marks)

SECTION – D

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

32. Derive an expression for workdone in isothermal and adabatic process.

33. Explain with necessary diagram how the thermal conductivity of a poor conductor is determined by Lee's disc method.

34. With the help of indicator diagram explain the working of petrol engine. Calculate the efficiency of a petrol engine.

35. State Wien's displacement law. Explain the distribution of energy in black body spectrum. What are the results distribution curves.

(2 × 15 = 30 Marks)
