Reg. No. : .....

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E – 4385

Second Semester B.Sc. Degree Examination, August 2018
First Degree Programme Under CBCSS
Complementary Course
PY 1231.1 : HEAT AND THERMODYNAMICS
(For Mathematics)
(2013 Admission Onwards)

Time : 3 Hours

Max. Marks : 80

SECTION – A

Answer **all** questions. **Each** question carries **1** mark.

1. What is an indicator diagram ?
2. State Wien's displacement law.
3. What is a refrigerator ?
4. Write down Clausius inequality.
5. Write down Planck's radiation law.
6. What is a positive work and negative work ?
7. Give the Kelvin statement of second law of thermodynamics.
8. What is a reversible process ? Give one example.
9. What is conduction ?
10. What is an adiabatic process ?

(10×1=10 Marks)

SECTION – B

Answer **any 8** questions. **Each** question carries **2** marks.

11. Draw the indicator diagram for a petrol engine and name the different processes.
12. Derive the expression for work done in an isothermal process.

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13. What is a T-S diagram ? Draw the T-S diagram for Carnot cycle.

14. State Wiedmann-Franz law. Give its significance.

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

16. Prove that adiabatic elasticity is γ times isothermal elasticity.

17. What is an isentropic process ? Show that reversible adiabatic processes are isentropic.

18. What is temperature gradient ? Obtain the expression to find temperature gradient.

19. How entropy and disorder are related ? Give any one example.

20. One mole of an ideal gas at 27°C expands isothermally to twice its original volume. Calculate the work done. R = 8.314J/mol.K.

21. Explain about ultraviolet Catastrophe ?

22. Draw the energy distribution curve of black body. Give any two results that can be obtained from distribution curves ? **(8×2=16 Marks)**

SECTION – C

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

23. Prove that $TV^{\gamma-1}$ = a constant for an adiabatic process.

24. Calculate the change in entropy when 1 kg of ice at a temperature T_1 is converted into steam at a temperature T_2.

25. Calculate the change in entropy when 10 kg of water at 100°C is converted into steam at the same temperature. Latent heat of steam is 540 cal/gram. (1 cal/gm = 4.2×10^3J).

26. A quantity of air at 27°C and one atmospheric pressure is suddenly compressed one third its original volume. Find the final pressure and temperature. $\gamma = 1.4$ (1 atm = 1.013×10^5 Pa).

27. Deduce the temperature at which a black body losses thermal energy at the rate of 2 watt/cm^2. Stefan's constant is 5.672×10^{-8} SI units.

28. The efficiency of a Carnot engine working between two temperatures is 0.2. When the temperature of the source is increased by 25 K, the efficiency increases to 0.25. Find the temperature of the source and sink.

29. A body at 1500 K emits maximum energy of wavelength 2000 nm. If the sun emits maximum energy of wavelength 550 nm, what would be the temperature of the sun ?

30. Calculate the blackbody temperature of the sun, given solar constant is 1.61×10^3 J/m^2/sec, radius of the sun is 7×10^5 Km, distance between earth and sun is 1.5×10^8 Km Stefan's constant is 5.672×10^{-8} SI units.

31. A quantity of air is isothermally compressed until its pressure is doubled. It is then allowed to expand adiabatically until its original volume is restored. Its pressure is then found to be 0.75 of the starting value. Calculate γ. **(6×4=24 Marks)**

SECTION – D

Answer **any 2** questions. **Each** question carries **15** marks.

32. Define solar constant. Explain an experiment to determine the solar constant using Pyrheliometer.

33. With necessary diagrams explain the working of a Carnot engine. Derive the expression for efficiency of a Carnot engine.

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

35. With the help of indicator diagram explain the working of diesel engine. Calculate the efficiency of a diesel engine. **(2×15=30 Marks)**