STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI – 600 086.

(For candidates admitted during the academic year 2004-05 & thereafter)

SUBJECT CODE : **PH/MC/TS24**

B.Sc. DEGREE EXAMINATION APRIL 2007

BRANCH III - PHYSICS

SECOND SEMESTER

COURSE : **MAJOR – CORE**

PAPER : **THERMAL PHYSICS AND STATISTICAL MECHANICS**

TIME : 2 ½ hours MAX. MARKS : 70

SECTION – B

ANSWER ANY FIVE QUESTIONS: (5 x 5 = 25)

1. A Carnol's engine is operated between two reservoirs at temperature 450K and 350k. If the engine receives 1000 calories of heat from the source in each cycle, Calculate the amount of heat rejected to the sink in each cycle. Calculate the efficiency of the engine and the work done by the engine in each cycle. [1 calorie=4.2J].

2. Find the work done by a perfect gas undergoing an isothermal expansion.

3. Calculate the total increase in entropy when $\log m$ of ice at $10^{\bullet}C$ is completely converted into steam at $100^{\bullet}$C.

4. Compare Bose _Einstein, Maxwell – Boltzmann and Fermi-Dirac statistics.

5. Calculate the energy which must be supplied to a domestic refregirator working between the temperature 30^{o}C and temperature of ice in order to freeze 2kg of water.

6. At what temperature a black body will radiate thermal energy at the rate of 10,000 Wm^{-2}.

7. Deduce first and second Tds equation.

ANSWER ANY THREE QUESTIONS: (3x15 = 30)

8.a. Discuss Fermi-Dirac distribution law and show that

$$n_i = \frac{gi}{e^{(\alpha+\beta E_i)}+1}$$

b. Also show that $n_i = \frac{g_i}{\left[e^{(Ei-Ef)/Kt}+1\right]}$

c. Draw the graph between ni / gi vs. E and discuss.

9. Explain entropy and disorder. Show that the entropy remains constant in a reversible process but increases in an irreversible process.

10. Describe Carnol's cycle and obtain an expression for the efficiency of an ideal heat engine in terms of its temperatures.

11. Explain transport phenomena in gases. Apply kinetic theory to obtain expression for the viscosity of a gas and discuss its dependence on temperature.

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12. Derive Planck's law of radiation of a black body. Show that Wien's law and Ray leigh- Jean's law are special cases of Planck's law.

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