STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI – 600 086
(For candidates admitted from the academic year 2025 – 2026)

B.Sc. DEGREE S EXAMINATION, APRIL 2026
BRANCH III – PHYSICS
SECOND SEMESTER

COURSE : CORE
PAPER : THERMAL PHYSICS AND STATISTICAL MECHANICS
SUBJECT CODE: 25PH/MC/TS24
TIME : 3 HOURS MAX. MARKS: 100

Q. No.	SECTION A Answer ALL the questions (4 x 3 = 12 marks)	CO	KL
1	Define co efficient of thermal conductivity.	1	1
2	State second law of thermodynamics.	1	1
3	Give the significance of T-S diagram.	1	1
4	Define Helmholtz function.	1	1
Q. No.	**SECTION B** **Answer ALL the questions (6 x 3 = 18 marks)**	**CO**	**KL**
5	What is the working principle of Lee's disc method?	2	2
6	Mention the significance of absolute zero of temperature.	2	2
7	Write a brief note on heat death of universe.	2	2
8	What is Gibb's function?	2	2
9	Define phase space.	2	2
10	List out the difference between boson and fermion.	2	2
Q. No.	**SECTION C** **Answer any FOUR questions (4 × 5 = 20 marks)**	**CO**	**KL**
11	Estimate the temperature of the sun using solar constant.	3	3
12	Deduce an expression for co-efficient of performance in a refrigerator.	3	3
13	Explain reversible and irreversible process.	3	3
14	Deduce Clausius clapeyron's latent heat equation.	3	3
15	Obtain an expression for a relation between entropy and probability.		
Q. No.	**SECTION D** **Answer any TWO questions (2 × 15 = 30 marks)**	**CO**	**KL**
16	Derive Wein's displacement law and discuss its importance.	4	4
17	Explain Carnot cycle. Derive an expression for the efficiency of a Carnot's engine.	4	4
18	Derive the Maxwell's four thermodynamical relations.	4	4
19	Explain fermi Dirac distribution function and obtain an expression for Fermi Energy.	4	4

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Q. No.	SECTION E **Answer any FOUR OUT OF SIX questions** **(4 x 5 = 20 marks)**	CO	KL
20	At what temperature a black body will radiate thermal energy at the rate of 1 watt per square cm?	5	5
21	Obtain second Tds equation.	5	5
22	A Carnot's refrigerator takes heat from water at 0°C and discards it to a room temperature at 27°C. 1 kg of water at 0°C is to be changed into ice at 0°C. How many calories of heat are discarded to the room? What is the work done by the refrigerator in this process? What is the coefficient of performance of the machine? (1 cal = 4.2 Joule).	5	5
23	A bar of length 0.3 m and uniform cross-section $5x10^{-4}$ m^2 consists of two halves, AB of copper and BC of iron, welded together at B. The end A is maintained at 473 K and end C at 273 K, and the sides are thermally insulated. Find the rate of flow of heat along the bar when the steady state has been reached. Thermal conductivities of copper and iron are 385 and 60 $Wm^{-1}K^{-1}$ respectively.	5	5
24	Find the fermi energy of copper on the assumption that each copper atom contributes one free electron to the electron gas. The density of copper is $8.94 x10^3$ kg/m^3.	5	5
25	Obtain an expression for entropy of a perfect gas.	5	5

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