QP CODE: D1BPH2403

Name: .....
Reg.No.: .....

FIRST SEMESTER FYUGP EXAMINATION NOVEMBER 2024

MINOR

PHY1MN102 PROPERTIES OF MATTER AND THERMODYNAMICS

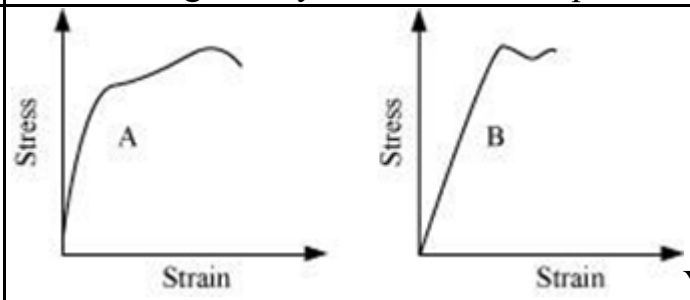
Time : 2 Hrs **Maximum Marks : 70**

BL - Bloom's Taxonomy Level (1 to 6) CO - Course Outcome

Section A

Ceiling Marks : 24

Answer all questions. Each carries 3 marks.

No.	Question	M	BL	CO
1.	What is a rigid body? What is the torque acting on a rigid body?	3	2	CO1
2.	 You are given two materials A and B. which one is brittle. Explain why?	3	4	CO1
3.	State and explain surface tension.	3	2	CO2
4.	What is zeroth law of thermodynamics?	3	1	CO4
5.	Justify the statement "in a thermometer, you are measuring the temperature of the thermometer".	3	3	CO4
6.	Draw the pV diagrams representing isothermal, adiabatic, isochoric, and isobaric processes.	3	2	CO4
7.	When ice melts at 0°C, its volume decreases. Is the internal energy change greater than, less than, or equal to the heat added? How can you tell?	3	4	CO4
8.	An aircraft engine takes in 9000 J of heat and discards 6400 J each cycle. (a) What is the mechanical work output of the engine during one cycle? (b) What is the thermal efficiency of the engine?	3	5	CO5
9.	Draw the pV diagram of a carnot cycle.	3	1	CO5
10.	What are the advantages of the Kelvin temperature scale compared to the ideal gas thermometer?	3	3	CO5

Section B

Ceiling Marks : 36

Answer all questions. Each question carries 6 marks.

No.	Question	M	BL	CO
11.	Why I shaped beam is used in the construction of bridge?	6	3	CO1
12.	Explain the working of open tube manometer and mercury barometer.	6	2	CO2
13.	If a metal wire has its length doubled and its diameter tripled, by what factor does its Young's modulus change?	6	3	CO1
14.	Two moles of an ideal gas are heated at constant pressure from T = 27°C to T = 107°C. (a) Draw a pV-diagram for this process. (b) Calculate the work done by the gas	6	5	CO4

15.	How much work does a quantity of gas (volume V, pressure p) do in each of these processes? (a) V increases from $2.00 \times 10^{-3} m^3$ to $4.50 \times 10^{-3} m^3$ while p is a constant $6.20 \times 10^4 Pa$. (b) V is a constant $2.00 \times 10^{-3} m^3$ while p increases from $6.00 \times 10^4 Pa$ to $9.00 \times 10^4 Pa$. (c) V decreases from $6.00 \times 10^{-3} m^3$ to $3.00 \times 10^{-3} m^3$ while p is a constant $1.25 \times 10^5 Pa$. (d) V increases from $2.00 \times 10^{-3} m^3$ to $4.50 \times 10^{-3} m^3$ while p increases from $1.50 \times 10^5 Pa$ to $5.50 \times 10^5 Pa$. The graph of this process on a pV-diagram is a straight line.	6	5	CO4
16.	You have 1.25 mol of hydrogen gas ($C_V = \frac{5}{2}R$ and $C_p = \frac{7}{2}R$) at absolute temperature 325 K. You allow the gas to expand adiabatically to a final temperature of 195 K. (a) How much work does the gas do while being compressed? (b) What is the ratio of its final volume to its initial volume? (c) What is the ratio of the final gas pressure to the initial gas pressure?	6	4	CO5
17.	Five moles of monatomic ideal gas have initial pressure $2.50 \times 10^3 Pa$ and initial volume 2.10 m^3. While undergoing an adiabatic expansion, the gas does 1480 J of work. What is the final pressure of the gas after the expansion?	6	5	CO5
18.	A Carnot engine is operated between two heat reservoirs at temperatures of 520 K and 300 K. (a) If the engine receives 6.45 kJ of heat energy from the reservoir at 520 K in each cycle, how many joules per cycle does it discard to the reservoir at 300 K? (b) How much mechanical work is performed by the engine during each cycle? (c) What is the thermal efficiency of the engine?	6	4	CO5

Section C

Answer any 1 question. Each carries 10 marks. (1x10=10 marks)

No.	Question	M	BL	CO
19.	State and prove Bernoulli's theorem and explain its applications.	10	2	CO2
20.	Define the Kelvin-Plank and Clausius statement of second law of thermodynamics. Using schematic diagrams, illustrate how the statements for an "engine" and a "refrigerator" are equivalent.	10	5	CO5

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