COLLEGE OF ENGINEERING, PUNE

(An Autonomous Institute of Government of Maharashtra.)

END Semester Examination

Programme: B.Tech / M.Tech

Semester: III

Course Code: PH-20001

Course Name: Foundation of Physics

Branch: All

Academic Year: 2022-23

Duration: 3 Hours

Max Marks: 60

Student PRN No. [redacted]

Instructions:

1. Figures to the right indicate the full marks.
2. Mobile phones and programmable calculators are strictly prohibited.
3. Writing anything on question paper is not allowed.
4. Exchange/Sharing of stationery, calculator etc. not allowed.
5. Write your PRN Number on Question Paper.

			Marks	CO
Q 1		*Solve any Five of the following:*		
	a	Discuss: The formation of stationary waves when the two identical waves going in opposite direction superimposes.	3	1
	b	Find an Electric field $E(x)$ if potential is given by, $V(x) = e^{kx}$ where 'k' is any constant.	3	3
	c	State and Explain any **THREE** properties of Nuclear force.	3	2
	d	Write Short notes: I) Core of Optical fibre II) Path difference.	3	1
	e	Discuss: Physical significance of the parameter –'Entropy' of a thermodynamic system.	3	4
	f	Find De-Broglie wavelength λ of a proton accelarated through potential differnece of 1000 Volts.($M_P = 1.6726 \times 10^{-27} kg, h = 6.64 \times 10^{-34} J - S$ $Charge\ on\ Proton = 1.6 \times 10^{-19} C$)	3	5
Q 2		*Solve any Five of the following:*		
	a	Derive an expression for critical propagation angle θ_c of an optical fibre using Snell's Law with neat labelled diagram	4	1
	b	Derive the expression for a path difference condition for an interference pattern of uniform thickness thin-film with labelled diagram with Maxima and Minima conditions.	4	1

c	Discuss: Three important parts of a heat engine with neat and labelled diagram.	4	4
d	A gas (n moles) expands isothermally from volume V_1 to V_2. The temperature of a gas is T. Find the work done by the gas, heat absorbed and change in internal energy during this process.	4	4
e	For a Fission of Uranium-235 Nucleus we have following data: *Mass of U-235 nucleus = 235.125 amu* *Mass of the neutron = 1.009 amu Total mass = 236.134 amu* *Mass of Ba-141 nucleus = 140.958 amu Mass of Kr-92 nucleus = 91.926 amu* *Mass of three neutrons = 3.027 amu Total mass = 235.911 amu.* Write the Nuclear reaction and Find energy from Fission of one Uranium-235 atom.	4	2
f	Derive an expression for Thermal efficiency in terms of absolute temperatures T_1 *and* T_2 of Carnot engine with labelled diagram.	4	4
Q 3	***Solve any <u>Five</u> of the following:***		
a	Using Ampere's Law, find the magnetic field 'B' at a point P which is at a distance '**r**' from a straight long wire carrying a steady current '**I**'.	5	3
b	Define- decay constant'λ'. . Derive an expression for a half –life $T_{1/2}$ of a Radioactive sample in terms of'λ'.	5	2
c	What is a System? Give at least two examples. Discuss different types of system depending on the interaction with surrounding.	5	4
d	What is a wave function 'ψ'. Discuss its Properties.	5	5
e	Two travelling waves of equal amplitudes and equal frequencies move in opposite directions along a string. These waves interfere to produce a standing wave having the equation, $y = A\cos kx \sin wt$ In which $A = 1.0mm \quad k = 1.57cm^{-1}\ w = 78.5s^{-1}$ Find a) the node closest to the origin in the region $x > 0$ b) The anti node closest to the origin in the region $x > 0$ c) The amplitude of the particle at $x = 2.33\ mm$	5	1
f	State: Gauss's Law in Electrostatics & Faraday law in Electrodynamics.	5	3

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