



K. K. Wagh Institute of Engineering Education & Research, Nashik
(An Autonomous Institute From A.Y. 2022-23)

SUMMER-2024	
Exam Seat No.:	
Academic Year: 2023-2024	Semester: II
Class: FY	Program: B.Tech
Branch Code: FYE	Pattern: 2022
Name of Course: Applied Physics-A	Course Code: FYE221003
Max. Marks: 60	Duration: 2.30 Hrs.

Instructions: Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.

1. This question paper contains 3 page(s).
2. Answer to each new question is to be started on a new page.
3. Assume suitable data wherever required, but justify it.
4. Draw the neat labelled diagrams, wherever necessary.
5. The last columns indicates the Course Outcome and level of Blooms Taxonomy of the Question/sub-question.
6. Given Constant : - Charge of electron / proton = 1.6×10^{-19} C

Mass of electron = 9.1×10^{-31} Kg

Mass of proton = 1.673×10^{-27} Kg

Mass of neutron = 1.673×10^{-27} Kg

Planks constant = 6.626×10^{-34} J.s

Permeability $\mu_0 = 4\pi \times 10^{-7}$

Velocity of light = 3×10^8 m/sec

Question No. 1 Attempt following Question

- 1a) In an electric motor, a coil of wire is rotated in a magnetic field. Explain how Fleming's left-hand rule can be used to determine the direction of the force that causes the rotation of the coil. (2) CO1
- 1b) A solenoid 20 cm long is wound with 225 turns. What is the field strength inside the solenoid when carrying a current of 2.5 Amp.? (4) CO5

Question No. 2 Attempt following Question

- 2a) Define both the "valence band" and "conduction band" in the context of semiconductor physics and conductivity of semiconductor materials. (2) CO1
- 2b) Calculate the number of donor atoms which must be added to an intrinsic semiconductor to obtain the resistivity as $10^{-6} \Omega \text{ cm}$ ($\mu_e = 1000 \text{ cm}^2/\text{V-Sec}$). (4) CO5

Question No. 3 Attempt following Question

- 3a) What is light? Differentiate polarized and unpolarized light. (At least 5 points) (6) CO3

OR

3b) What is diffraction of light? What are the types of diffraction and differentiate them? (Atleast 4 points) . (6) CO3

3c) With the help of a well labelled diagram explain the interaction of matter and radiation in the processes of (i) spontaneous absorption (ii) spontaneous emission and (iii) stimulated emission. (6) CO1

OR

3d) Explain the interference in reflected light due to uniform thickness film and describe its mathematical condition for interference. (6) CO1

3e) A monochromatic beam of light of wavelength 5893 \AA is incident normally on the top of a glass which is coated by transparent material MgF_2 having R.I. 1.38. Calculate smallest thickness of the MgF_2 layer which will act as a non-reflecting surface. (4) CO5

OR

3f) How should the Polarizer and Analyzer be oriented to reduce intensity of beam to 50% and 25 % of its original intensity? (4) CO5

Question No. 4 Attempt following Question

4a) State and explain the properties of matter waves. (6) CO3

OR

4b) Explain the wave function. Give physical significance of wave function. State the conditions of the well-behaved wave function. (6) CO3

4c) What is de-Broglie's hypothesis. Show that De-Broglie wavelength of an electron (charged particle) is inversely proportional to the potential by which it is accelerated. (6) CO1

OR

4d) Derive the expression of the Schrödinger time-dependent wave equation for three-dimensional particles. (6) CO1

4e) At what kinetic energy an electron will have a wavelength of 5000 \AA ? (4) CO4

OR

4f) Calculate the de Broglie Wavelength of electron of energy 1keV. (4) CO4

Question No. 5 Attempt following Question

5a) What is the basic working principle of solar cells? Explain the construction and working of a solar cell. (6) CO2

OR

5b) What is a wind farm? How does a Wind Turbine Work? Explain all three types of wind farms. (6) CO2

5c) Draw I-V characteristics of solar cell. Define (6) CO1

(1) open circuit voltage (2) short circuit current

(3) Fill factor (4) Efficiency of Solar cell.

OR

5d) Explain the process of formation and working of p-n junction diode with zero bias energy band diagram. (6) CO1

5e) A wind turbine of 50m diameter, where the air density is 1.165 kg/m^3 . The wind speed at that location is 12.5 m/s. Find the available wind energy. (4) CO5

OR

5f) At a particular site, where air density is 2.1 Kg/m^3 , the wind is available at 8 m/sec. Find out the power density available in the wind. (4) CO5

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX