



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 : F.Y.B.Tech.	Program : F.Y.B.Tech
Branch Code : FYE	Pattern : 2023
Name of Course : Applied Physics (B)	Course Code : 2300103B
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 pages.
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.

Constants :

Charge of an electron = 1.6×10^{-19} C

Mass of electron = 9.1×10^{-31} Kg

Acceleration due to gravity = 9.81 m/s^2

Question No. 1 Attempt following Question

- 1a) Define uniform acceleration motion and hence write all equations of motion. (2) CO1
- 1b) A stone is thrown vertically downward from a height of 40 m with an initial velocity of 10 m/s. Calculate the time it takes for the stone to hit the ground. (4) CO5

Question No. 2 Attempt following Question

- 2a) Define the terms time of flight and maximum height related to a projectile motion. (2) CO1
- 2b) A boat starts from rest and travels around a circular path of radius 40 m at a velocity 6.25 m/s. Find the normal and tangential component of acceleration at $t = 10$ sec and hence total acceleration of the boat. (4) CO5

Question No. 3 Attempt following Question

- 3a) Derive the equation for conductivity of semiconductor and hence write conductivity equation for all the types of semiconductor. (6) CO2

OR

- 3b) Differentiate between - i) Type I and type II superconductor (6) CO2
- ii) Low and High T_c superconductor

- 3c) Define Fermi level in Semiconductor. With the help of neat labeled diagram draw and explain the position of Fermi level in n-type semiconductor at 0K and 300K. (6) CO2

OR

- 3d) Explain the three nanostructures using the diagram and hence explain how it affects the properties of nanomaterial. (6) CO2

- 3e) A superconducting tin has a critical temperature of 3.7 K and a critical field of 0.0306 Tesla at 0 K. Find the critical field at 2 K. (4) CO4

OR

- 3f) Calculate the Hall voltage developed across the bismuth material when the magnetic field applied is 8 A/M, current through it is 4 A, width is 5 mm and the concentration of carrier in it is $2.33 \times 10^{24} / \text{m}^3$. (4) CO4

Question No. 4 Attempt following Question

- 4a) Explain with diagram how principle of interference is used to design antireflection coating and hence derive an equation for its thickness. (6) CO1

OR

- 4b) State the phenomena of Double refraction and hence explain Huygen's theory of Double refraction. (6) CO1

- 4c) Define diffraction grating and explain how it is developed. Write path difference, conditions for maxima and minima intensity point due to grating with the meaning of each term in the equation. (6) CO1

OR

- 4d) Define the terms metastable state and population inversion. Explain the four properties of Laser. (6) CO1

- 4e) A wedge-shaped air film having an angle of 40 seconds is illuminated by monochromatic light and fringes are observed vertically through a microscope. The distance measured between consecutive bright fringes is 0.12 cm. Calculate the wavelength of light used. (4) CO4

OR

- 4f) A polarizer and an analyzer are oriented so that the amount of light transmitted is maximum. How can the analyzer be oriented so that the intensity of transmitted light is reduced to 1) $\frac{2}{5}$ 2) 0.65 of maximum. (4) CO4

Question No. 5 Attempt following Question

- 5a) Explain how the electron-hole pairs are generated and gets recombined in silicon. (6) CO1

OR

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

Define (1) open circuit voltage (2) short circuit current
(3) Fill factor (4) Efficiency of Solar cell.

- 5c) Explain the difference between first, second and third generation solar cell. (6) CO2

OR

- 5d) Explain with example - i) primary and secondary energy resources (6) CO2
ii) renewable and non-renewable energy sources
iii) Commercial & non-commercial energy sources

- 5e) What are merits & demerits of a solar cell. (4) CO4

OR

- 5f) Explain how the earth's atmosphere is responsible for attenuation or depletion of solar radiation. (4) CO4

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