



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

WINTER-2024	
Exam Seat No.:	
Academic Year: 2024-2025	Semester: I
Class: F.Y. B.Tech.	Program: 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 2 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

Marks CO

Question No. 1

- 1a) Explain the concept of dependent motion using example of pulleys. (2) CO1
- 1b) An airplane accelerates down a runway at 7.5 m/s^2 for 30.5 seconds before it finally life off the ground. Calculate the distance that it travelled before take-off. (4) CO4

Question No. 2

- 2a) Draw the diagram for a projectile motion and hence explain with the help of its components of velocity of projectile. (2) CO1
- 2b) The position of a particle is defined by $x = t^3 + 3t^2 + 8t$, where t is in seconds. Determine the magnitude of the velocity and acceleration when $t = 4$ s. (4) CO4

Question No. 3

- 3a) Explain Fermi level in metal and hence show that Fermi function obeys rectangular distribution in metal at 0 K. Also discuss Fermi's function at $T > 0$ K & $E = E_F$. (6) CO1

OR

- 3b) Explain the classification of solids on the basis of band theory using neatly drawn diagrams. (6) CO2
- 3c) What is nanotechnology? Explain the optical and electrical properties of nanoparticles. (6) CO3

OR

- 3d) Distinguish between (6) CO3
- i) Type-I and Type- II superconductors (Any 3 Points)
- ii) LTS & HTS Superconductor (Any 3 Points).

- 3e) A copper strip 2 cm wide and 1 mm thick is placed in a magnetic field with $B = 1.5 \text{ wb/m}^2$. If a current of 200 A is set up in the strip, calculate Hall voltage that appears across the strip. Assume $R_H = 6 \times 10^{-7} \text{ m}^3/\text{C}$. (4) CO4

OR

- 3f) A sample of intrinsic germanium at room temperature has a carrier concentration $4.41 \times 10^{22} / \text{cm}^3$. Donor impurity is added in the ratio 1 donor atom per 10^8 atoms/ cm^3 of Germanium. Determine the resistivity of the material thus formed. (Given: $\mu_e = 3800 \text{ cm}^2 / \text{V. s}$) (4) CO4

Question No. 4

- 4a) Draw the intensity curve for diffraction due to a single slit and give the conditions for minima & maxima intensity. Explain Rayleigh's criterion of resolution using neatly drawn diagrams. (6) CO1

OR

- 4b) Discuss the interference due to a wedge-shaped film and hence, write the equation for path difference, constructive and destructive interference, bandwidth for air film and film with a R.I. μ . (6) CO1
- 4c) Explain properties of Laser and the applications of Laser in medical and industry. (6) CO1

OR

- 4d) Explain the principal of total internal reflection of light waves and hence explain use of it in the construction and working of optic fiber. (6) CO1
- 4e) A parallel beam of light 400 nm is incident on a glass plate of refractive index 1.60 such that angle of refraction into the plate is 35° . Calculate the smallest thickness of the plate which will appear dark by reflection. (4) CO4

OR

- 4f) Monochromatic light of wavelength 6560 \AA falls normally on a grating 2 cm wide. The first order spectrum is produced at an angle of $16^\circ 12'$ from the normal. Calculate total number of lines on the grating. (4) CO4

Question No. 5

- 5a) Explain principle, construction and working of solar cell with neatly drawn diagram. (6) CO1

OR

- 5b) Explain the concept of wind farms and its three types. (6) CO1
- 5c) What is solar energy. Give classification of solar technology and its applications. (6) CO5

OR

- 5d) Explain the process of electron-hole pair generation and recombination with the help of suitable diagram. (6) CO5
- 5e) Explain with example the difference between primary and secondary energy resources. (4) CO5

OR

- 5f) At a particular site, air density is 2.2 kg/m^3 , the wind I available is at 10 m/sec. Find out the power density available in the wind. (4) CO5

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