GUJARAT TECHNOLOGICAL UNIVERSITY

BE- 1 SEMESTER – OLD PAPER – S23 TO S25 – QUESTION BANK

Subject Name & Code:

Physics- 3110011

Module 1: Properties of Matter

Repeated Questions:

1. **Derive expression for depression of a cantilever and state its applications.**
   - (Summer 2023 - Q2c - 07 Marks)
   - (Winter 2022 - Q1c - 07 Marks)
   - (Winter 2023 - Q1c - 07 Marks)
   - (Summer 2024 - Q2c (OR) - 07 Marks)
2. **Derive expression for twisting couple/torque on a wire/shaft.**
   - (Summer 2023 - Q1c - 07 Marks)
   - (Winter 2022 - Q1b - 04 Marks)
   - (Winter 2023 - Q1b - 04 Marks)
   - (Winter 2024 - Q1a - 03 Marks)
   - (Summer 2022 - Q2b(i) - 02 Marks)
3. **Draw and explain the Stress-Strain diagram.**
   - (Summer 2022 - Q2c - 07 Marks)
   - (Winter 2022 - Q1a - 03 Marks)
   - (Winter 2023 - Q1a - 03 Marks)
   - (Summer 2024 - Q1b - 04 Marks)

Other Important Questions:

- (Summer 2023 - Q1a) - Define Ductility, Brittleness, Elasticity.
- (Summer 2023 - Q3b) - Calculate Poisson's ratio and rigidity modulus.
- (Summer 2022 - Q2a) - Calculate stress, strain, elongation.
- (Summer 2022 - Q2b(ii)) - Calculate twist produced.
- (Winter 2023 - Q3a (OR)) - Calculate stress, strain, Young's modulus.
- (Winter 2024 - Q1b) - Define and give equations for Young's, Bulk, Rigidity moduli and Poisson's ratio.

Module 2: Waves, Motion and Acoustics

Repeated Questions:

1. **Define/Explain Simple Harmonic Motion (SHM) and derive expressions for energy/velocity/acceleration.**
    - (Summer 2023 - Q2a - 03 Marks)
    - (Winter 2022 - Q2c - 07 Marks)
    - (Summer 2022 - Q1b - 04 Marks)
    - (Winter 2023 - Q2c (OR) - 07 Marks) *[Damped motion]*
    - (Winter 2024 - Q2c - 07 Marks) *[Damped motion]*
    - (Winter 2024 - Q5c(ii)) - Numerical on SHM.
2. **Numerical or theoretical on Reverberation Time and Sabine's Formula.**
    - (Summer 2023 - Q3a - 03 Marks)
    - (Winter 2022 - Q2a, Q2b - 03+04 Marks)
    - (Summer 2022 - Q3b - 04 Marks)
    - (Winter 2024 - Q2a - 03 Marks)
    - (Summer 2024 - Q2a - 03 Marks)
    - (Summer 2024 - Q4b (OR) - 04 Marks)
3. **Explain factors affecting acoustics of buildings and their remedies.**
    - (Summer 2023 - Q3c - 07 Marks)
    - (Winter 2024 - Q2c (OR) - 07 Marks)
    - (Summer 2024 - Q4b - 04 Marks)

Other Important Questions:

- (Winter 2023 - Q2b) - Discuss forced vibration and amplitude resonance.
- (Summer 2022 - Q3a(ii)) - Define SHM.
- (Summer 2022 - Q3b) - Define Damped Harmonic Motion.

Module 3: Ultrasonics & NDT

Repeated Questions:

1. **Explain production of ultrasonic waves by Magnetostriction method.**
    - (Summer 2023 - Q3c (OR) - 07 Marks)
    - (Winter 2022 - Q3c - 07 Marks)
    - (Winter 2023 - Q3c - 07 Marks)
    - (Summer 2022 - Q3c - 07 Marks)
2. **Explain production of ultrasonic waves by Piezoelectric method.**
    - (Winter 2023 - Q1c(i,ii,iii) - 07 Marks)
    - (Winter 2022 - Q3a - 03 Marks)
    - (Summer 2023 - Q4a - 03 Marks)
3. **Numericals on calculating length of rod for ultrasonic production or depth of sea using SONAR.**
    - (Summer 2023 - Q3a (OR) - 03 Marks)
    - (Summer 2023 - Q4b - 04 Marks)
    - (Winter 2023 - Q3b - 04 Marks)
    - (Winter 2024 - Q3b - 04 Marks)
    - (Summer 2024 - Q3b - 04 Marks)
    - (Summer 2024 - Q3c(ii)) - 04 Marks)
    - (Summer 2022 - Q4b - 04 Marks)
4. **Explain applications of ultrasonics/NDT (Flaw detection, SONAR).**
    - (Summer 2023 - Q4c - 07 Marks)
    - (Winter 2022 - Q3b - 04 Marks)
    - (Summer 2022 - Q4c - 03 Marks)
    - (Summer 2024 - Q3c(i)) - 03 Marks)

Other Important Questions:

- (Winter 2022 - Q3a (OR)) - Properties of ultrasound.
- (Winter 2022 - Q3c (OR)) - Detection of ultrasonic waves.
- (Winter 2023 - Q3c (OR)) - Detection of ultrasonic waves.
- (Summer 2024 - Q3a) - Properties of ultrasonic waves.
- (Summer 2024 - Q3c) - Acoustic Grating method.
- (Winter 2024 - Q3a) - Properties of ultrasonic sound.

Module 4: Superconductivity

Repeated Questions:

1. **Explain Meissner effect and show $\chi_m = -1$ for superconductors.**
    - (Summer 2023 - Q5c - 07 Marks)
    - (Summer 2022 - Q4a - 03 Marks)
    - (Summer 2024 - Q1a - 03 Marks)
2. **Compare Type-I and Type-II superconductors.**
    - (Summer 2023 - Q3b (OR) - 04 Marks)
    - (Winter 2022 - Q4b - 04 Marks)
    - (Winter 2024 - Q4b - 04 Marks)
    - (Summer 2024 - Q5b - 04 Marks)
3. **Numericals on critical magnetic field, critical current, or isotopic mass effect.**
    - (Summer 2023 - Q5a - 03 Marks)
    - (Winter 2022 - Q4b (OR)) - 04 Marks)
    - (Winter 2023 - Q4b - 04 Marks)
    - (Winter 2024 - Q4a - 03 Marks)
    - (Summer 2024 - Q5a - 03 Marks)
    - (Summer 2022 - Q5a, Q5c(ii)) - 03+04 Marks)
4. **Explain properties of superconductors.**
    - (Winter 2022 - Q4c (OR) - 07 Marks)
    - (Winter 2024 - Q4c - 07 Marks)
    - (Summer 2024 - Q5c - 07 Marks)

Other Important Questions:

- (Winter 2022 - Q4a) - Effect of magnetic field and current on superconductivity.
- (Winter 2022 - Q4c) - BCS Theory.
- (Winter 2023 - Q4a) - Josephson junction.
- (Winter 2023 - Q4c) - London penetration depth & applications.
- (Summer 2024 - Q5c(i,ii)) - SQUID and London Penetration Depth.
- (Winter 2024 - Q4c) - Effects on superconductors (magnetic field, isotope, etc.).
- (Summer 2022 - Q4c) - Josephson Effect.

Module 5: Lasers

Repeated Questions:

1. **Explain construction and working of Ruby Laser.**
    - (Summer 2023 - Q5c - 07 Marks)
    - (Winter 2022 - Q5c - 07 Marks)
    - (Winter 2023 - Q4c (OR) - 07 Marks)
    - (Winter 2024 - Q4c (OR) - 07 Marks)
    - (Summer 2024 - Q4c - 07 Marks)
2. **Explain construction and working of He-Ne Laser.**
    - (Summer 2023 - Q3d - 07 Marks)
    - (Winter 2022 - Q5c (OR) - 07 Marks)
    - (Winter 2023 - Q5c - 07 Marks)
    - (Summer 2024 - Q4c (OR) - 07 Marks)
3. **Define/Explain: Population Inversion, Metastable State, Pumping, Stimulated Emission.**
    - (Summer 2023 - Q1b, Q4a - 03+04 Marks)
    - (Winter 2022 - Q5a - 03 Marks)
    - (Winter 2023 - Q5b - 04 Marks)
    - (Winter 2024 - Q5b - 04 Marks)
    - (Summer 2024 - Q2b - 04 Marks)
4. **Explain properties/applications of Laser.**
    - (Summer 2022 - Q1c - 07 Marks)
    - (Winter 2022 - Q5a - 03 Marks)
    - (Winter 2023 - Q5b - 07 Marks)
    - (Winter 2024 - Q5a (OR) - 03 Marks)
    - (Summer 2024 - Q4a (OR)) - 03 Marks)
    - (Summer 2024 - Q4a - 03 Marks)

Other Important Questions:

- (Winter 2022 - Q5b) - Einstein's theory (amplification not possible).
- (Winter 2023 - Q5a) - Numerical on laser energy/wavelength.
- (Winter 2024 - Q5a) - Numerical on laser energy levels.