

GUJARAT TECHNOLOGICAL UNIVERSITY

DI -1 SEMESTER – OLD PAPER – W24 TO S25 – QUESTION BANK(English)

Subject Name & Code:

Modern Physics- DI01000061

Unit 1: Units and Measurements

Repeated Questions:

1. **Differentiate between Accuracy and Precision.**
 - Appeared in: W24 (Q2a-1, 03 marks)
2. **Explain zero, positive and negative errors for vernier calipers with a proper diagram.**
 - Appeared in: W24 (Q2b-2, 04 marks), S25 (Q2b-1, 04 marks)
3. **Draw a neat sketch of a micrometer screw gauge and write the names of its different parts.**
 - Appeared in: S25 (Q2a-1, 03 marks), W24 (Q2b-1, 04 marks)
4. **Calculate the Least Count of a Vernier Caliper where 20 divisions of the vernier scale are equal to 19 divisions of the main scale (1 M.S.D. = 1 mm).**
 - Appeared in: S25 (Q2a-3, 03 marks)
5. **In an experiment for finding the periodic time of a simple pendulum, the observations are 1.96s, 1.98s, 2.00s, 2.02s, 2.04s. Calculate absolute error, mean absolute error, relative error, and percentage error.**
 - Appeared in: W24 (Q2b-3, 04 marks), S25 (Q2b-3, 04 marks)

Other Important Questions:

- Determine the diameter of a sphere measured by a micrometer screw gauge. (Main scale reading is 5 mm and the 50th division of the circular scale is coinciding. L.C. is 0.01 mm). (W24 - Q2a-2, 03 marks)
- The observations of periodic time for one simple pendulum are 2.42s, 2.56s, 2.63s, 2.71s, and 2.80s. Find the percentage error in the observation of periodic time. (S25 - Q2b-3, 04 marks)
- 0.0031 has _____ significant digits. (MCQ) (S25 - Q1-3, 01 mark)

Unit 2: Electrostatics

Repeated Questions:

1. **State and Explain Coulomb's Law with its mathematical formula.**
 - Appeared in: S25 (Q2a-2, 03 marks)
2. **Describe any four properties of electric field lines.**
 - Appeared in: S25 (Q2b-2, 04 marks), W24 (Q3b-2, 04 marks)
3. **Define: Electric flux, Electric field, Electric potential, Potential Difference.**
 - Appeared in: S25 (Q3a-1, 03 marks), W24 (Q3a-1, 03 marks)
4. **Derive the formula for the equivalent capacitance when three different capacitors are connected in series.**
 - Appeared in: W24 (Q3a-2, 03 marks)
5. **Prove $C = \epsilon_0 A/d$ for a parallel plate capacitor.**
 - Appeared in: W24 (Q3b-1, 04 marks)
6. **Calculate the amount of electric charge stored on either plate of a capacitor of capacitance $4 \mu\text{F}$ when connected across a 12-volt battery.**
 - Appeared in: W24 (Q2a-3, 03 marks)

Other Important Questions:

- Coulomb is the SI unit of _____. (MCQ) (S25 - Q1-2, 01 mark)
- The quantization of electric charge is represented by _____. (MCQ) (S25 - Q1-6, 01 mark)
- Two charges with a value of $20 \mu\text{C}$ and $10 \mu\text{C}$ are separated by a 0.02 m distance in air. Find the electric force between these charges. ($K = 9 \times 10^9 \text{ N m}^2/\text{C}^2$). (S25 - Q3a-3, 03 marks)
- The distance between the two plates is 1 mm . If we want to get a capacitance of 0.1 F , how much area of the plate should be? ($\epsilon_0 = 8.85 \times 10^{-12} \text{ F/m}$). (S25 - Q3b-3, 04 marks)
- Explain the concepts of a capacitor, capacitance, and the working of a parallel plate capacitor. (Syllabus Objective)

Unit 3: Waves and Ultrasonics

Repeated Questions:

1. **Define: Infrasonic sound, Audible Sound, Ultrasonic sound.**
 - Appeared in: W24 (Q3a-3, 03 marks)
2. **Give any three differences between longitudinal waves and transverse waves.**
 - Appeared in: S25 (Q3a-1, 03 marks)
3. **Explain any two applications of ultrasonic waves in detail.**
 - Appeared in: S25 (Q3a-2, 03 marks)
4. **Describe the working and construction of the magnetostriction method used for the production of ultrasonic waves.**
 - Appeared in: W24 (Q3b-3, 04 marks)
5. **Write any three properties of ultrasonic waves.**
 - Appeared in: S25 (Q4a-1, 03 marks)

Other Important Questions:

- Number of oscillations performed per unit time is called _____. (MCQ - Frequency) (W24 - Q1-6, 01 mark)
- The velocity of sound waves is maximum in _____. (MCQ - Solid) (W24 - Q1-10, 01 mark)
- The propagation of a light wave is due to _____. (MCQ - Crest and Trough) (W24 - Q1-11, 01 mark)
- Frequency range of Infrasonic waves are _____. (MCQ - Less than 20Hz) (S25 - Q1-7, 01 mark)
- Which of the following is a non-mechanical wave? (MCQ - Light wave) (S25 - Q1-5, 01 mark)
- One sound wave has a 500Hz frequency and 1500m/s velocity. Find out its wavelength. (S25 - Q3b-2, 04 marks)
- Explain SONAR and NDT (flaw detection) as applications of ultrasonic waves. (Syllabus Objective)

Unit 4: LASER and Fiber Optics

Repeated Questions:

1. **State Snell's law and explain the refractive index of media.**
 - Appeared in: W24 (Q4a-2, 03 marks), S25 (Q1-8, 01 mark MCQ)
2. **Explain the phenomenon of total internal reflection with a figure.**
 - Appeared in: S25 (Q4a-3, 03 marks)
3. **Compare/Distinguish between Ordinary light and LASER light.**
 - Appeared in: W24 (Q4a-3, 03 marks), S25 (Q4a-2, 03 marks)
4. **List applications of LASER in engineering and medical fields.**
 - Appeared in: W24 (Q4b-2, 04 marks), S25 (Syllabus Objective)
5. **Demonstrate/Draw the structure of an optical fiber with a necessary diagram.**
 - Appeared in: W24 (Q4b-1, 04 marks), S25 (Q4b-2, 04 marks)
6. **Optical fiber works on the principle of _____. (MCQ - Total Internal Reflection)**
 - Appeared in: W24 (Q1-5, 01 mark), S25 (Q1-9, 01 mark)

Other Important Questions:

- Refractive index of glass is _____. (MCQ - 1.50) (W24 - Q1-2, 01 mark)
- When an angle of incidence becomes _____ critical angle, total internal reflection occurs. (MCQ - greater than) (W24 - Q1-3, 01 mark)
- LASER radiation is _____. (MCQ - Monochromatic / All of these) (W24 - Q1-12, 01 mark), (S25 - Q1-10, 01 mark)
- Which fiber provides longer bandwidth? (MCQ - Single mode) (W24 - Q1-13, 01 mark)
- What is the value of the acceptance angle of an optical fiber having a numerical aperture of 0.5? (MCQ - 30°) (W24 - Q1-14, 01 mark)
- In an optical fiber cable, the inner part is called _____. (MCQ - Core) (S25 - Q1-11, 01 mark)
- Light enters in a glass medium from air. Glass has a refractive index of 1.56. Find the velocity of light in glass. ($C=3 \times 10^8$ m/s). (S25 - Q5a-3, 03 marks)
- An optical fiber has values of refractive indices for core and cladding as 1.48 and 1.45, respectively. Calculate the numerical aperture and acceptance angle. (S25 - Q5b-3, 04 marks)
- Explain the construction and working principle of step index and graded index optical fibers. (Syllabus Objective)

Unit 5: Semiconductor Devices

Repeated Questions:

1. **Explain P-type and N-type semiconductors.**
 - Appeared in: W24 (Q4b-3, 04 marks), S25 (Q5a-2, 03 marks)
2. **Explain the forward and reverse bias characteristics of a P-N junction diode.**
 - Appeared in: W24 (Q4b-4, 04 marks), S25 (Q5b-1, 04 marks)
3. **Explain a full wave/Bridge rectifier with its circuit diagram and input-output waveforms.**
 - Appeared in: W24 (Q4b-5, 04 marks), S25 (Q4b-3, 04 marks)
4. **Explain the working of a Zener diode as a voltage regulator.**
 - Appeared in: W24 (Q4b-6, 04 marks), S25 (Q5b-2, 04 marks)
5. **Explain OR, AND, and NOT gates with their truth tables.**
 - Appeared in: W24 (Q4b-7, 04 marks), S25 (Q5a-1, 03 marks)
6. **Write the principle of LED and explain its construction and working.**
 - Appeared in: W24 (Q4b-8, 04 marks), S25 (Syllabus Objective)

Other Important Questions:

- Which of the following is a semiconductor? (MCQ - Si) (W24 - Q1-1, 01 mark)
- How many P-N junction diodes are used in a Bridge rectifier? (MCQ - 4) (W24 - Q1-4, 01 mark)
- Which type of impurity is added to make a P-type semiconductor? (MCQ - Trivalent) (S25 - Q1-4, 01 mark)
- Which of the following is a semiconductor material? (MCQ - Silicon) (S25 - Q1-12, 01 mark)
- With an increase in the forward bias voltage of a PN junction, the width of the depletion layer _____. (MCQ - Decreases) (S25 - Q1-13, 01 mark)
- LEDs emit light due to the phenomenon of _____. (MCQ - Electroluminescence) (S25 - Q1-14, 01 mark)
- Draw the symbols for (1) p-n junction diode (2) Zener diode and Define: (3) valence electron (4) doping process. (S25 - Q4b-1, 04 marks)
- Identify conductors, semiconductors, and insulators based on energy band gap. (Syllabus Objective)
