Enrollment No./Seat No.: _____

GUJARAT TECHNOLOGICAL UNIVERSITY
Bachelor of Engineering - SEMESTER - I/II EXAMINATION - WINTER 2025

Subject Code: BE01000021/BE01R00021 **Date: 20-12-2025**

Subject Name: Physics

Time: 02:30 PM TO 05:00 PM **Total Marks: 70**

Instructions

1. Attempt all questions.

2. Make suitable assumptions wherever necessary.

3. Figures to the right indicate full marks.

4. Simple and non-programmable scientific calculators are allowed.

			Marks
Q.1	**(a)**	Enlist any six applications of Laser.	**03**
	(b)	Summarize any four factors affecting the acoustics of a building and discuss their remedies.	**04**
	(c)	Derive relation between elevation in rectangular beam, its length, breadth, thickness and Young's modulus in case of uniform bending.	**07**
Q.2	**(a)**	A screen is separated from double slit source by 2 m. The distance between the two slits is 0.040 mm. The 3rd order bright fringe on the screen is measured to be 6.0 cm from the central line. Determine the wavelength of light.	**03**
	(b)	Explain elastic hysteresis and elastic fatigue in brief.	**04**
	(c)	Explain various applications of ultrasonic waves in industry including NDT in detail.	**07**

OR

			Marks
	(c)	What is simple harmonic motion? Obtain equation for kinetic energy and potential energy of simple harmonic oscillator. Show that at any time the sum of kinetic energy and potential energy remains constant.	**07**
Q.3	**(a)**	Find the lowest energy of an electron confined to move in a cubical box of length 0.14 nm.	**03**
	(b)	Discuss wave particle duality using de Broglie hypothesis and derive the relation between wavelength and velocity of microscopic particle.	**04**
	(c)	Explain Newton's rings experiment and derive equation for the bright and dark fringes.	**07**

OR

			Marks
	(a)	Calculate the resultant sound level when a 75 dB is added to 85 dB sound?	**03**
	(b)	Introduce Michelson interferometer and its working briefly.	**04**
	(c)	Based on dimensions, enlist the types of nanomaterial and discuss the PVD method with schematic diagram for synthesis of thin film.	**07**
Q.4	**(a)**	A superconductor with isotopic mass of 198 has critical temperature 198 K. What will be critical temperature of second isotope with mass 202.	**03**

(b) Apprise using necessary energy level diagram that why 4 level laser and not 3 level laser is required for continuous operation. **04**

(c) Derive the equation for energy levels of a particle enclosed in one dimensional potential box. **07**

OR

(a) Calculate the twisting couple on a solid shaft of 1.5 m length and 0.12 m diameter when it is twisted through an angle of 0.0104 rad. The coefficient of rigidity of the material is 9.3×10^{10} N/m^2. **03**

(b) What is black body radiation? Deduce Wien's law and Rayleigh-Jeans law from Planck's black body radiation law. **04**

(c) Define following terms: (1) Active medium (2) Pumping (3) optical resonator (4) population inversion (5) metastable state (6) stimulated emission and (7) coherence. **07**

Q.5 (a) Using necessary circuit diagram analyze the working of Zener diode as a voltage regulator. **03**

(b) Describe critical magnetic field and Meissner effect for superconductors with suitable diagrams. **04**

(c) Explain construction and working of Ruby laser using schematic diagram and energy level diagram. **07**

OR

(a) Discuss Huygen's principle in brief. **03**

(b) What are extrinsic and intrinsic semiconductors? How are p-type and n-type semiconductors made? **04**

(c) Derive the formula for the intensity of light in Young's double slit experiment and discuss the case for maximum and minimum intensity. **07**

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