

Seat No.: _____

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A Charutar Vidya Mandal's Institution
V.P. & R.P.T.P. SCIENCE COLLEGE
(AUTONOMOUS) (Grant-in-Aid)
Affiliated to Sardar Patel University
VALLABH VIDYANAGAR-388120



Bachelor of Science (Semester 1) External Examination - 2024

Subject: Physics

US01MAPHY01: Mechanics and Optics

Date: 19-11-2024, Tuesday

Time: 11:00 AM to 01:30 PM

Total marks :50

Q-1 Write the most appropriate answer from the following multiple-choice questions. [10]

- (1) The ratio of normal stress to volume strain is called _____.
 - (a) Young modulus
 - (b) bulk modulus
 - (c) modulus of rigidity
 - (d) Poisson's ratio
- (2) The Poisson's ratio can have the value _____.
 - (a) -1.5
 - (b) 0.3
 - (c) 0.6
 - (d) 1.5
- (3) The twisting couple per unit twist of a cylinder depends on _____.
 - (a) Young modulus
 - (b) bulk modulus
 - (c) modulus of rigidity
 - (d) Poisson's ratio
- (4) The sound waves having frequencies less than 20 Hz are called _____ waves.
 - (a) Infrasonic
 - (b) audible
 - (c) ultrasonic
 - (d) visible
- (5) _____ is a ferromagnetic material.
 - (a) Iodine
 - (b) Sodium
 - (c) Copper
 - (d) Iron
- (6) The working principle of Jamin's interferometer is based on division of _____.
 - (a) Frequency
 - (b) wavelength
 - (c) amplitude
 - (d) wavefront
- (7) In Michelson interferometer, when mirror M_1 and M_2 are exactly perpendicular, the shape of the fringes will be _____.
 - (a) straight line
 - (b) Circular
 - (c) elliptical
 - (d) inclined



- (8) Resolving power of a prism = _____.
 (a) nN (b) $\frac{a}{\lambda}$
 (c) $t \frac{d\mu}{d\lambda}$ (d) $\frac{\sin i}{0.61 \lambda}$
- (9) Normally, in CD ROM, a laser beam of _____ is used for writing.
 (a) 5 mW (b) 25 W
 (c) 5 W (d) 25 mW
- (10) Nd:YAG laser gives output in the _____ region.
 (a) infrared (b) ultraviolet
 (c) visible (d) microwave

- Q-2 (A) For stretching a wire, derive formula for the work done per unit volume. [06]
 (B) Calculate the work done in stretching a wire having length 1 m and area of cross section 1 sq. mm through 0.1 mm. Given: $Y = 2 \times 10^{11} \text{ N/m}^2$. [04]

OR

- Q-2 (A) Derive formula of Poisson's ratio $\sigma = \frac{1}{2} \left(1 - \frac{1}{A} \frac{dV}{dL} \right)$ for a rubber tube. [06]
 (B) Obtain the formula for the depression of a beam supported at the ends and loaded at the centre. [04]
- Q-3 (A) Discuss piezo-electric method for the production of ultrasonic in detail. [06]
 (B) Discuss any two applications of ultrasonic in detail. [04]

OR

- Q-3 (A) Describe Kater's reversible pendulum and derive an expression for acceleration due to gravity for Kater's pendulum. [06]
 (B) Write a short note on detection of ultrasonic waves. [04]
- Q-4 (A) Explain principle, construction and working of Michelson interferometer. [06]
 (B) Write a note on applications of phenomenon of interference of light. [04]

OR

- Q-4 (A) Derive an expression of resolving power of a plane diffraction grating. [06]
 (B) Explain Rayleigh's criterion for resolution of images. [04]
- Q-5 (A) Write a note on CO₂ laser. [06]
 (B) Discuss any two properties of lasers in detail. [04]

OR

- Q-5 (A) Write a note on Nd:YAG laser. [06]
 (B) Discuss any one application of laser in material processing in detail. [04]

