

Total No. of printed pages = 3

PH 181201

Roll No. of candidate

2/8/22

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2022

B.Tech. 2nd Semester End-Term Examination

PHYSICS - 201

(New Regulation & New Syllabus)

Full Marks - 100

Time - Three hours

The figures in the margin indicate full marks for the questions.

Answer question No. 1 and any *four* from the rest.

(10 × 1 = 10)

1. (i) Which of the following is not a central force
- (a) Electrostatic force (b) Spring force
(c) Gravitational force (d) Viscous force
- (ii) Permanent set exist in a material
- (a) Beyond the elastic limit (b) At the elastic limit
(c) Below the elastic limit (d) Both (a) and (b)
- (iii) Shock absorber in a car is an example of
- (a) Undamped simple harmonic motion
(b) Under damped simple harmonic motion
(c) Critically damped simple harmonic motion
(d) Over damped simple harmonic motion
- (iv) Which of this ratio gives the value of viscosity of fluid?
- (a) Ratio of shearing stress to the weight of the fluid
(b) Ratio of the shearing stress to the density of the fluid
(c) Ratio of the velocity gradient to shearing stress
(d) Ratio of the shearing stress to velocity gradient

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- (v) A room in which the loudness of the sound increases due to reverberation
- (a) Live room (b) Dead room
(c) Both (a) and (b) are true (d) Both (a) and (b) are false
- (vi) Intensity of sound is increased by a factor of 100 increases the intensity level in decibel by
- (a) 2dB (b) 10dB
(c) 20dB (d) 40dB
- (vii) Which of the following statement is correct?
- (a) An achromatic doublet should consist of two concave lenses
(b) An achromatic doublet should consist of two convex lenses
(c) An achromatic doublet should consist of one concave and one convex lens
(d) None of the above
- (viii) Vibrations of the screen of a microphone are
- (a) Free oscillations (b) Damped oscillations
(c) Resonant oscillations (d) Forced oscillations
- (ix) Surface area per unit volume for nanoparticles is
- (a) Higher than macro-sized particles
(b) Same as macro-sized particles
(c) Lower than macro-sized particles
(d) None of the above
- (x) Chromatic aberration in an optical lens occurs due to the phenomenon of
- (a) Dispersion of light (b) Interference of light
(c) Diffraction of light (d) Polarization of light

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2. (a) If one end of a bar is fixed and load is applied to the other end, find an expression for depression at the other end. (5)
- (b) A copper wire of 3 meter length 0.001 meter diameter having young modulus of $12.5 \times 10^{10} \text{N/m}$ is taken. What is the extension produced if weight of 10 kg is attached to the free end. If poisson's ratio is 0.26, find internal depression produced. (5)
- (c) Find an expression for the acceleration of a simple harmonic oscillator. Show that for a body executing simple harmonic motion the acceleration leads the velocity by $\pi/2$ and displacement by π . (5)

3. (a) Write the expression for Reynolds's number Explain its significance. (4)
- (b) Describe Ostwald's viscometer and expressed how it can be used for comparison of viscosities of two liquids. (7)
- (c) A plane metal 100cm^2 area rests on a layer of castor oil 2 mm thick whose coefficient of viscosity is 15.5 poise. Calculate the horizontal force required to move the plate with a speed 3cm/sec . (4)
4. (a) Define axial chromatic aberration in a lens. Show that it is equal to the mean focal length of the lens times the dispersive power of the material of the lens (2+4=6)
- (b) What is meant by spherical aberration in a lens? Discuss the various methods of reducing spherical aberration. (2+4=6)
- (c) The dispersive powers of crown and flint glasses are 0.02 and 0.04 respectively. Find the focal lengths of the two components of an achromatic doublet of focal length 20cm. (3)
5. (a) Show that Coriolis force owes its existence to the motion of a particle with respect to a rotating frame of reference. Explain how Coriolis force is responsible for the direction of trade winds. (7+2=9)
- (b) What is sharpness of resonance? Explain the effect of damping on resonance. (3+3=6)
6. (a) Explain various factors affecting architectural acoustics and their remedies. (6)
- (b) What is piezoelectric effect? Describe the construction of a piezoelectric oscillator for the production of ultrasonic waves. (2+4=6)
- (c) A hall has a volume of 500m^3 . It is required to have reverberation time 1.5 sec. What should be the total absorption of the hall? (3)
7. (a) What do you understand by nanoparticles? Discuss the basic difference between OD, 1D, 2D and 3D materials. (2+3=5)
- (b) Discuss in short various techniques for the synthesis of nanoparticles. (5)
- (c) What are shape memory alloys? Explain the different phases of SMA. (2+3=5)