

Total No. of printed pages = 6

**PH 171101**

Roll No. of candidate

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2018

**B.Tech. 1st Semester End-Term Examination**

**ENGINEERING PHYSICS — I**

**(New Regulation & New Syllabus)**

**(W.e.f. 2017-2018)**

Full Marks – 70

Time – Three hours

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

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

1. Write the correct option for the following questions :  
(10 × 1 = 10)
- (i) The ratio of the lateral strain to the longitudinal strain is termed as
- (a) Shearing stress
  - (b) Young's modulus
  - (c) Poisson's ratio
  - (d) Bulk modulus

**[Turn over**

(ii) The relation between the three elastic constants is

(a)  $\frac{1}{K} + \frac{3}{\eta} = \frac{9}{Y}$

(b)  $\frac{12}{K} + \frac{3}{\eta} = \frac{9}{Y}$

(c)  $\frac{1}{Y} + \frac{3}{\eta} = \frac{9}{K}$

(d) None of these

(iii) The walls of a musical concert hall should

(a) transmit sound

(b) amplify sound

(c) absorb sound

(d) reflect sound

(iv) If  $l$ ,  $Y$  and  $\rho$  be the thickness Young's modulus and density of the piezoelectric crystal, then the fundamental frequency of vibration of crystal will be

(a)  $\frac{1}{l} \sqrt{\frac{Y}{\rho}}$

(b)  $\frac{1}{2Y} \sqrt{\frac{l}{\rho}}$

(c)  $\frac{1}{2\rho} \sqrt{\frac{Y}{l}}$

(d)  $\frac{1}{2l} \sqrt{\frac{Y}{\rho}}$

(v) Molecules which tend to orient themselves in an external field are called

(a) non-polar

(b) polar

(c) ionic

(d) all

(vi) Expression of internal field (Lorentz field) is expressed as

(a)  $E_i = E - \frac{3P}{\epsilon_0}$

(b)  $E_i = E + \frac{3P}{\epsilon_0}$

(c)  $E_i = E + \frac{P}{3\epsilon_0}$

(d) None of the above

(vii) Magnetic induction B and the magnetic field intensity H are related by

(a)  $B = \mu_0 + H$

(b)  $B = \mu_0 H^2$

(c)  $H = \mu_0 B$

(d)  $B = \mu_0 \mu_r H$

(viii) The unit of dipole moment per unit volume is

- (a) Coulomb/metre
- (b) Coloumb/metre<sup>2</sup>
- (c) Coloumb/metre<sup>3</sup>
- (d) Coulomb

(ix) The group velocity of matter waves is equal to

- (a) particle velocity
- (b) phase velocity
- (c) velocity of light
- (d) wave velocity

(x) In order to understand the behavior of nanomaterials, the laws we depend upon

- (a) Newton's laws of motion
- (b) All classical laws
- (c) Quantum mechanics
- (d) All of these

2. (a) Find the depression of the loaded end of a cantilever.

(b) For volume strain, prove that strain energy per unit volume =  $\frac{1}{2} \times \text{stress} \times \text{strain}$ . (10 + 5 = 15)

3. (a) Explain an experiment to produce ultrasonic waves.
- (b) Write few applications of ultrasonic waves.  
(10 + 5 = 15)
4. (a) For a dielectric material, prove that,  $k = 1 + \frac{\chi}{\epsilon_0}$ ,  
the terms have their usual meanings.
- (b) Write briefly about dielectric loss.
- (c) What is the polarization produced in sodium chloride by an electric field of 500 V/m if the relative permittivity of the material is 6?  
(5 + 5 + 5 = 15)
5. (a) What are ferromagnetic materials?
- (b) Write few differences between paramagnetic and diamagnetic materials.
- (c) With proper diagram of a hysteresis loop, explain the properties, retentivity and coercivity.
- (d) What are hard and soft magnetic materials.  
(2 + 3 + 5 + 5 = 15)
6. (a) Explain de Broglie hypothesis.
- (b) Find the relation between group velocity and phase velocity.
- (c) The kinetic energy of an electron is 500 eV. What will be the de Broglie wavelength associated with it?  
(5 + 5 + 5 = 15)

7. (a) What are the properties of nanomaterials?
- (b) With the help of a potential well, explain quantum confinement.
- (c) Write few applications of nanomaterials.
- (5 + 5 + 5 = 15)
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