Total No. of printed pages = 6

PH 171101

Roll No. of candidate

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

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 :

$(10 \times 1 = 10)$

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

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

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

(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 ρ be the thickness Young's modulus and density of the piezoelectric crystal, then the fundamental frequency of vibration of crystal will be

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

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

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

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

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(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) $E_i = E - \dfrac{3P}{\varepsilon_0}$

    (b) $E_i = E + \dfrac{3P}{\varepsilon_0}$

    (c) $E_i = E + \dfrac{P}{3\varepsilon_0}$

    (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^2

    (c)   Coloumb/metre^3

    (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 $= \frac{1}{2} \times$ stress $\times$ 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, $k = 1 + \dfrac{\chi}{\varepsilon_0}$, 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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