AO—112—2018

FACULTY OF SCIENCE

B.Sc. (Third Semester) EXAMINATION

MARCH/APRIL, 2018

PHYSICS

Paper VI

(Waves, Oscillations and Acoustics)

(MCQ+Theory)

(Wednesday, 4-4-2018)   **Time : 2.00 p.m. to 4.00 p.m.**

Time—2 *Hours*   *Maximum Marks*—40

N.B. :— (i)   Attempt *All* questions.

(ii)   Q. No. **1** is MCQ type, answer MCQ questions on OMR sheet only.

(iii)   Negative marking system is applicable for MCQs.

(iv)   Question Nos. **2, 3, 4** are descriptive type.

(v)   Symbols used in the question paper have their usual meanings.

(MCQ)

1.   (i)   In stationary wave every node is separated by a distance of :   10

(a) λ (b) 2λ

(c) $\dfrac{\lambda}{2}$ (d) $\dfrac{\lambda}{4}$

(ii)   In case of stationary wave rate of transfer of energy is :

(a)   not   (b)   zero

(c)   maximum   (d)   non-zero

P.T.O.

(*iii*)   If $y = \left(2a\sin\dfrac{2\pi}{\lambda}x\right)\cos\dfrac{2\pi}{\lambda}Vt$ is the resultant displacement stationary

wave, then amplitude of this wave is :

(*a*) $2a$ (*b*) $2a\cos\dfrac{2\pi}{\lambda}Vt$

(*c*) $2a\sin\dfrac{2\pi}{\lambda}x$ (*d*) $\sin\dfrac{2\pi}{\lambda}x$

(*iv*) $\dfrac{d^2y}{dt^2} = V^2\dfrac{d^2y}{dx^2}$ equation represents :

(*a*)   differential equation of wave motion

(*b*)   simple harmonic equation

(*c*)   equation of straight line

(*d*)   none of the above

(*v*) $V_{max} = \dfrac{2\pi}{\lambda}aV$, this is the expression for :

(*a*)   Maximum particle velocity

(*b*)   Maximum wave acceleration

(*c*)   Maximum wave velocity

(*d*)   None of the above

(*vi*)   The maximum value of the amplitude when $n = P$ (nearly) is :

(*a*) $A_m = \dfrac{1}{2kn}$

(*b*) $A_m = \dfrac{1}{kn}$

(*c*) $A_m = \dfrac{1}{n^2 p^2}$

(*d*) $A_m = \dfrac{F}{2kn}$

(*vii*) In FPS unit Sabine's formula for determination of reverberation time is :

(*a*) $t_1 = \dfrac{0.158 \, V}{\Sigma A\alpha}$ (*b*) $t = \dfrac{0.05 \, V}{A\alpha}$

(*c*) $t = \dfrac{1.58}{A\alpha}$ (*d*) $\dfrac{0.05}{A\alpha}$

(*viii*) In conservative oscillatory motion of a particle, the sum of K.E. and P.E. :

(*a*) is zero   (*b*) is constant

(*c*) increases   (*d*) decreases

(*ix*) Magnetostriction generator generates :

(*a*) Stationary waves   (*b*) Transverse waves

(*c*) Ultrasonic waves   (*d*) Longitudinal waves

(*x*) Lowest wavelength of ultrasonic wave is :

(*a*) 31,100 cm   (*b*) 20,000 cm

(*c*) 10,000 cm   (*d*) 1.65 cm

(Theory)

2. Attempt any *five* of the following :   10

(*a*) Define stationary wave.

(*b*) Write down the equation of simple harmonic progressive wave.

(*c*) What do you mean by forced vibrations ?

(*d*) Define absorption coefficient.

(*e*) Define ultrasonics.

(*f*) What are free vibrations ?

(*g*) Write Sabine's formula.

3. Attempt any *two* of the following :   10

(*a*) Derive the relation between wave velocity and particle velocity.

P.T.O.

(*b*) Explain the phenomenon of resonance and sharpness of resonance.

(*c*) Explain how velocity of sound in liquid is determined by acoustic grating.

(*d*) Obtain an expression for distribution of energy per unit area in a stationary wave.

4. Attempt any *one* of the following : 10

(*a*) Obtain an expression for total energy of a plane progressive wave.

(*b*) What is the piezo-electric effect ? Explain piezo-electric generator for generation of ultrasonic waves.