S.Y.B.SC. SEM – IV (CBCS - 2016 COURSE) : SUMMER - 2018
SUBJECT : PHYSICS : WAVES & OSCILLATIONS

Day : **Thursday**
Date : **19/04/2018**

S-2018-0665

Time : **11.00 A.M. TO 02.00 PM**
Max. Marks : 60

N.B.:

1) All questions are **COMPULSORY**.
2) Figures to the right indicate **FULL** marks.

Q.1 Attempt **ANY TWO** of the following: **[12]**

a) An alternating emf of peak value 200 Volt is applied across the series combination of an inductor of inductance 20 mH, a capacitor of capacitance 2μF and resistance of 50 Ω. Determine resonant frequency, quality factor and band width.

b) The two S.H.M's are perpendicular to each other and having equal period in the ratio 1:2, if the path difference between them is zero, obtain the resultant motion of the path.

c) Prove that in steady state of forced oscillations, the average power absorbed by system is equal to the average power dissipated in it.

Q.2 Attempt **ANY TWO** of the following: **[12]**

a) Obtain expression for the velocity of transverse waves on a stretched string.

b) An engine blowing a whistle is travelling with speed v_s along the normal towards a plane reflecting surface. Show that the apparent rise in frequency of echo heard by the driver is approximately given by $n'' - n = \frac{2v_s}{v}.n$ where v is speed of sound in air, n is the frequency of whistle. (Assume air at rest)

c) Show that the Doppler effect in sound is asymmetric in nature.

Q.3 Attempt **ANY TWO** of the following: **[12]**

a) The amplitude of a pendulum of period 0.5 sec falls to half of its initial value in 230.3 seconds. Determine the quality factor.

b) A particle performing SHM has velocity 8 cm/sec and 10cm/sec when it is at a distance 5 cm and 4 cm respectively, from the mean position. What is its amplitude?

c) A 5 kg block extends a spring by 25 cm from its unstretched position. The block is removed and a body 0.7 kg body is hung from the same spring. If the spring is then stretched and released, what is its period of motion?

P.T.O.

Q.4 Attempt **ANY THREE** of the following: **[12]**

a) What are P-waves, S-waves, R-waves and L-waves?

b) Describe the applications of Doppler effect.

c) What is quality factor (Q) of forced oscillation? Obtain the resonance condition at special case $\omega = q$.

d) Explain any one method for obtaining Lissajous figures.

Q.5 Attempt **ANY FOUR** of the following: **[12]**

a) Define damped harmonic oscillations. Draw curves showing over damped, critically damped and damped oscillatory motion of an oscillator.

b) The equation of forced oscillations of an oscillator is given as $4\left(\frac{d^2x}{dt^2}\right) + 2\left(\frac{dx}{dt}\right) + 144x = 25\sin qt$. Determine the resonant frequency at which velocity resonance takes place. Also determine quality factor at resonance and half width.

c) The velocity of sound in water of density 1000 kg/m^3 is 1500m/s. Determine bulk modulus of elasticity.

d) What is resonance? State applications of resonance.

e) A simple harmonic of mass 50 gm oscillates along a path length of 0.2m at a frequency of 10Hz. What is its energy?

f) The equation for critically damped motion is given in the form $3\left(\frac{d^2x}{dt^2}\right) + R\left(\frac{dx}{dt}\right) + 48x = 0$, determine value of R.

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