

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR  
(DEPARTMENT OF PHYSICS)

Name of the Exam: Minor-11 (B.Tech. 1st Semester).

Course Title: Physics (common paper).

Code: PHY 101.

(October 2011)

Max. Marks: 20

Time: 01 hour.

Note: Attempt all questions. Each question carries equal two marks.  
Answer should be in brief.

Q.No.1: Show that the velocity of a damped harmonic oscillator falls exponentially with time.

Q.No.2: Write down the differential equation of a driven harmonic oscillator and obtain expression for its maximum amplitude.

Q.No.3: Explain how the half width of the resonance curve measures of the sharpness of resonance

Q.No.4: A harmonic oscillator consisting of a 50 gm mass attached to massless spring has a quality factor 200. If it oscillates with an amplitude of 2 cm in resonance with a periodic force of frequency 20 c.p.s, calculate the rate of dissipation of energy.

Q.No.5: Write down the Maxwell's equation in a non-conducting medium.

Q.No.6: If the damping be low and the driven frequency ( $p$ ) is high than show that the amplitude of the driven oscillator is given by  $A = f_0/p^2$ , where  $f_0 = F_0/m$

Q.No.7: Justify: i) Electromagnetic Wave travels with the velocity of light and ii) electric vector is more important than magnetic vector.

Q.No.8: Write down the differential equation of a damped harmonic oscillator and discuss it in the case of critical damping.

Q.No.9: Why are damping devices used on machinery?

Q.No.10: An electric vector  $\vec{E}$  of an electromagnetic wave in free space is given by  $E_x = E_z = 0$  and  $E_y = A e^{i\omega(t-z/c)}$ . Find the  $H_x$  component in free space.