

Uva Wellassa University, Sri Lanka  
End Semester Examination – February/March 2011  
SCT 252-2 Physics II & Repeat



Time: Two (02) hours

Total 04 Questions

Answer ALL questions

Each question contains 25 marks

- 01) i). Find an expression for fringe width in case of Young's double slit experiment. (10 marks)
- ii). Prove that in this case of interference dark and bright bands are of equal width. (5 marks)
- iii). A young's double slit experiment is carried out with monochromatic light in air. What will be the change in wavelength and fringe width when the apparatus are immersed in water or the medium is replaced by an optically denser medium ? (5 marks)
- iv). Distance between two slits is 0.1 mm and the width of the fringes formed on the screen is 5mm. If the distance between the screen and the slit is 1 m calculate the wave length of light used. (5 marks)
- 02) i). Distinguish between interference and diffraction. (4 marks)
- ii). Explain the formation of Newton's rings by reflected light. Why Newton's rings are circular? (5 marks)
- iii). Derive the condition for production of maxima and minima in the Fraunhofer diffraction due to a single slit. (12 marks)
- iv). A single slit of width 1 mm is illuminated by light of wavelength 589 nm. Find the angular spread of the central maximum of diffraction pattern observed. (4 marks)
- 03) i). A particle is simultaneously subjected to three simple harmonic motions of same frequency and in the  $x$  direction. If the amplitudes are 0.25, 0.20 and 0.15 mm, respectively and the phase difference between the first and second is  $45^\circ$  and between the second and third  $30^\circ$ , find the amplitude of the resultant displacement and its phase relative to the first (0.25 mm amplitude) component. (10 marks)

- ii). Two masses  $m_1$  and  $m_2$  are coupled by a spring of spring constant  $k$  and the unstretched length and the spring is stretched to a length  $l$  ( $l > l_0$ ) as in Fig. Q3. Show that the system oscillates with a frequency of  $\sqrt{\frac{k}{\mu}}$ , where  $\mu = \frac{m_1 m_2}{m_1 + m_2}$  is the reduced mass.

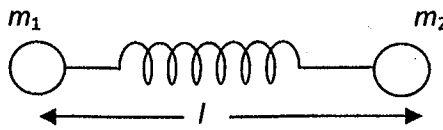


Figure Q3

(15 marks)

- 04). i). Show that the equation of motion of a particle moving under a restoring force which is proportional to the displacement of the particle from a fixed point and a damping force which is proportional to the 1<sup>st</sup> power of the velocity of the particle is  $\ddot{x} + \gamma\dot{x} + \omega_0^2 x = 0$
- (6 marks)
- ii). Obtain the solution of the above equation if  $\frac{\gamma^2}{4} < \omega_0^2$ .
- (12 marks)
- iii). Find the displacement of the particle if  $x = 0$  and  $\dot{x} = v$  at  $t = 0$ .
- (7 marks)