

- 03) i. Explain clearly the followings given below.
- Concept of optical path
 - Superposition theorem
 - Huygens' principle
 - The phenomenon of interference
- (02×4=08 marks)
- ii. a. Derive the Gauss' formula for a lens. State the sign convention system you used.
- (09 marks)
- b. An optical system consists of two thin lenses, a convex lens of focal length 20 cm and a concave lens of focal length 10 cm, and separated by a distance of 8 cm. An object 1 cm in height is placed at a distance 50 cm from the convex lens. Find the position and size of the image.
- (08 marks)

- 04) A mass m hangs from a uniform spring of spring constant k .
- What is the period of oscillations in the system?
- (07 marks)
- What would it be if the mass m was hung so that
 - It was attached to two identical springs hanging side by side (Fig 1(a))

(08 marks)

 - It was attached to the lower of two identical springs connected end to end (Fig 1(b))

(10 marks)

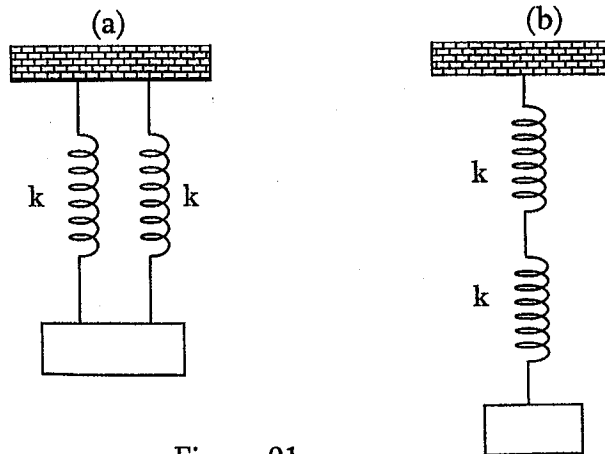


Figure 01

- 05) i. A particle is simultaneously subjected to three simple harmonic motions, all of the same frequency and along the x direction. The amplitudes are 0.25, 0.20 and 0.15 mm, respectively. The phase difference between the first and second is 45° and between the second and third is 30° . Find the amplitude of the resultant displacement and its phase relative to the first (0.25 mm amplitude) component.
- (06 marks)
- ii. Two vibrations along the same line are described by the equations $y_1 = A \cos(10\pi t)$ and $y_2 = A \cos(12\pi t)$. Find the beat period, and draw a careful sketch of the resultant disturbance over one beat period.
- (07 marks)
- iii. Construct the Lissagous figures of the combined motion.
- (a) $x = \cos(2\omega t)$ and $y = \sin(2\omega t)$
- (b) $x = \cos(2\omega t)$ and $y = \cos(\omega t)$
- (c) $x = \cos(2\omega t)$ and $y = \cos(2\omega t - 45^\circ)$

(04×3=12 marks)