International University – VNUHCM
Department of Physics

August 2024
Midterm

Student Name: .....
Student ID: .....

QUESTIONS

$k=1 \rightarrow d_1 = 0.65\,m$; $d_2 = 1.15\,m$
$k=2 \rightarrow d_1 = 0.4\,m$; $d_2 = 1.4\,m$
$k=3 \rightarrow d_1 = 0.15\,m$; $d_2 = 1.65\,m$.

Question 1 (20 marks) Two identical loudspeakers driven in phase at 686 Hz (f) by a common audio oscillator are turned to face each other at a distance of 180 cm (L). Use 343 m/s for the speed of sound.

a) Compute the wavelength of the sound. $\lambda = \frac{v}{f} = \frac{343}{686} = 0.5\,m.$

b) Locate the points between the speakers along a line joining them for which the sound intensity is maximum.

Question 2 (20 marks) A string fixed at both ends is 3.00 m (L) long. There is a standing wave in its second harmonic at a frequency of 60.0 Hz. What are the wavelength and the speed of waves on the string? $\lambda_1 = 6\,m$, $\lambda_2 = 3\,m$, $v = 180\,m/s$

Question 3 (20 marks) A listener is moving 80 m/s away from a stationary source that is at rest. Find the frequency heard by the listener. Assume that the source emits sound at a frequency of 200 Hz and the sound travels through still air at 343 m/s. 153.4 Hz $f' = \frac{v + (-v_{ls})}{v} f$

Question 4 (20 marks) Light of wavelength 633 nm from a helium–neon laser is shone normally on a plane containing two slits in Young's experiment. The first interference maximum (1.) is 82 cm from the central maximum on a screen 12 m away.

a) Find the separation (d.) of the slits. $d = \frac{L}{i}\lambda = 9.263 \times 10^{-6}\,m.$

b) How many interference maxima is it, in principle, possible to observe? 29

Question 5 (20 marks) Light of wavelength 500 nm is incident normally on a diffraction grating. The third-order maximum of the diffraction pattern is observed at 32.0°.

$d \sin(32) = 3 \times 500 \times 10^{-9}$

a) What is the number of rulings per centimeter for the grating? $d = 2.8306 \times 10^{-4}\,m$
$N = 3532$ slit/cm

b) Determine the total number of primary maxima that can be observed in this situation.

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– END OF QUESTIONS –