UNIVERSITY OF THE PUNJAB

First Semester – 2019

Examination: B.S. 4 Years Program

Roll No. in Fig. .....

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Signature of Supdt.:

PAPER: Waves, Oscillations and Optics **MAX. TIME: 15 Min.**

Course Code: PHY-102 Part – I (Compulsory) **MAX. MARKS: 10**

Attempt this Paper on this Question Sheet only.

Please encircle the correct option. Division of marks is given in front of each question.

This Paper will be collected back after expiry of time limit mentioned above.

Q.1. Encircle the right answer, cutting and overwriting is not allowed. (1x10=10)

1. For the spring constant k and mass m, increase in the amplitude of the body performing SHM result the time period to

   (a) increase **(b)** decrease **(c)** remain unchanged **(c)** vary randomly

2. A body performing SHM, and having A as its maximum displacement, the total mechanical energy remains equal to

   (a) $(\frac{1}{2})\, kx^2$ **(b)** $(1/2)\, mV^2{}_x$ **(c)** $(1/2)\, kA^2$ **(d)** zero

3. Using the rotational analog of Newton's second law for a rigid body, the equation of motions is

   (a) $-\kappa\theta = I\alpha$ **(b)** $-\kappa\alpha = I\theta$ **(c)** $-\alpha = I\theta$ **(d)** $-\kappa\alpha = I$

4. Strong damping causes

   (a) increased amplitude **(b)** small time period **(c)** both unchanged **(d)** none

5. A wave pulse in the string is not inverted when reflected from the end which is

   (a) fixed **(b)** free **(c)** connected to another string **(d)** none

6. In a standing wave, which of the following point appear with maximum amplitude?

   (a) node **(b)** anti-node **(c)** very first point **(e)** none

7. The oscillatory motion in which all particles move sinusoidally with the same frequency is called as

   (a) normal mode **(b)** node **(c)** overtones **(d)** harmonics

8. Sound wave propagation occurs due fluctuations in the

   (a) temperature **(b)** speed **(c)** pressure **(d)** amplitude

9. Snell's law describes the angles of the wave while the wave at the interface is

   (a) reflected **(b)** absorbed **(c)** vanished **(d)** refracted

10. Final image formed by the human eye at the retina is always

    (a) real and erect **(b)** imaginary and erect **(c)** real and inverted **(d)** imaginary

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Roll No. .....

PAPER: Waves, Oscillations and Optics
Course Code: PHY-102 Part – II

MAX. TIME: 2 Hrs. 45 Min.
MAX. MARKS: 50

ATTEMPT THIS (SUBJECTIVE) ON THE SEPARATE ANSWER SHEET PROVIDED

Q.2: Please give short answers to the following question. **(2×10 =20)**

1. How does the simple magnifier cause angular magnifications?
2. Differentiate refracting and reflecting telescopes.
3. Using Young's double-slit experiment geometry, derive an expression for indexing the bright fringes.
4. How does the interference pattern is changed when thickness of the thin film is increased?
5. Why Newton's rings are circular?
6. Briefly describe various applications of sound resonance?
7. Give reason behind the appearance of central maxima in single-slit diffraction pattern.
8. Differentiate reflection and transmission diffraction gratings.
9. Show that scattering of X-rays from atoms in the adjacent rows leads to Bragg's conditions.
10. Describe Rayleigh's criterion for resolving two point objects.

Q.3: Please give short answers to the following question. **(30)**

1. Derive an expression for the speed of sound in a fluid **(8)**
2. How would you derive a wave equation for a wave traveling in the positive x-direction? **(8)**
3. Derive Lensmaker's equation for thin lenses. **(7)**
4. On a day when the speed of sound is the fundamental frequency of a particular stopped organ pipe is 220 Hz. (a) How long is this pipe? (b) The second overtone of this pipe has the same wavelength as the third harmonic of an open pipe. How long is the open pipe. **(4)**
5. An airplane is flying at Mach 1.75 at an altitude of 8000 m, where the speed of sound is 320m/s. How long after the plane passes directly overhead will you hear the sonic boom. **(3)**