

D 31829

(Pages : 2)

Name.....

Reg. No.....

**THIRD SEMESTER (CBCSS—UG) DEGREE EXAMINATION  
NOVEMBER 2022**

Physics/Applied Physics

PHY 3C 03—MECHANICS, RELATIVITY, WAVES AND OSCILLATIONS

(2019 Admission onwards)

Time : Two Hours

Maximum : 60 Marks

*The symbols used in question paper have their usual meanings.***Section A (Short Answer Type)**

*Answer **all** questions in two **or** three sentences,  
each correct answer carries a maximum of 2 marks.*

1. Distinguish between inertial and non-inertial frames of references.
2. Show that the path of a particle moving in the influence of a central force lies in a plane.
3. What do you mean by a non-conservative force ? Give two examples.
4. State the postulates of the special theory of relativity.
5. Plot the potential energy versus displacement curve of a simple harmonic oscillator.
6. What do you mean by a simple pendulum ?
7. Write down the differential equation for a damped harmonic oscillator. What are the terms involved in the equation ?
8. What do you mean by the term Q-factor of an oscillator ? What is the Q-factor of an undamped oscillator ?
9. Distinguish between a progressive and a stationary wave.
10. Draw the spectrum of a blackbody.
11. Write down expressions for energy and momentum operators in three dimensions.
12. Write down the time dependent Schroedinger equation. What are the terms involved ?

(Ceiling 20)

**Turn over**

**Section B (Paragraph/Problem Type)**

*Answer all questions in a paragraph of about half a page to one page, each correct answer carries a maximum of 5 marks.*

13. What is Coriolis force ? Give an expression for the same. Under what conditions does it come into play ? What is its direction ?
14. Calculate the fictitious and the total force on a body of mass 2.5 kg relative to a frame moving vertically upwards on earth with an acceleration  $10 \text{ m/sec}^2$ .
15. A mass  $m$  is revolving in a vertical circle at the end of a string of length  $r$  metre. Calculate the difference in kinetic energies at the bottom and top of the circle.
16. A planewave of frequency 256 Hz and amplitude  $10^{-3}$  is produced in air. Calculate the energy density and energy flux of the wave if the density of air is  $1.29 \text{ kg/m}^3$  and the velocity of sound in air is 332 m/s.
17. How fast a spaceship be moved for its length to be contracted to 90 % of its length at rest ?
18. Light of wavelengths  $3125 \text{ \AA}$  and  $3650 \text{ \AA}$  causes the emission of electrons having kinetic energies 2.128 eV and 1.595 eV respectively from sodium. Determine the value of Planck's constant from this data.
19. An electron is accelerated through a potential difference of 100 V. Determine the wavelength of the de Broglie wave associated with it.

(Ceiling 30)

**Section C (Essay Type)**

*Essays-Answer in about two pages, any one question.*

*Answer carries 10 marks*

20. Explain the law of conservation of linear momentum. What do you mean by centre of mass frame of reference ? Obtain an expression for the centre of mass of a thin uniform rod.
21. Using a suitable figure, outline the Michelson-Morley experiment.

(1 × 10 = 10 marks)