SECOND SEMESTER B.Sc. DEGREE EXAMINATION, APRIL 2023

(CBCSS - UG)

(Regular/Supplementary/Improvement)

CC19U PHY2 B02 / CC20U PHY2 B02 - MECHANICS - II

(Physics - Core Course)

(2019 Admission onwards)

Time : 2.00 Hours   Maximum : 60 Marks

Credit : 2

Part A (Short answer questions)

Answer *all* questions. Each question carries 2 marks.

1. Write down the Galilean transformation equations.

2. Define inertial frame and non-inertial frame. Give examples.

3. Can a particle in rest with respect to an inertial frame feel Coriolis force? Why?

4. What are the consequences of coriolis force due to spin rotation of earth on the water and air flow on earth?

5. Draw the energy diagram for a system of two particles mutually attracted by gravitational force.

6. Draw the energy diagram for a system of two non-interacting particles moving in opposite direction in straight lines with the minimum possible distance between them as b.

7. Obtain the time average of the function $(f(t) = cos^2 \omega t)$ over a time period.

8. What is the relaxation time of a damped harmonic oscillator?

9. What is an undamped driven oscillator? Give examples.

10. What is a progressive wave?

11. What is potential energy density of a wave? Write down the expression for it.

12. Write down the expression for a travelling wave in one, two and three dimensions.

(Ceiling: 20 Marks)

Part B (Short essay questions - Paragraph)

Answer *all* questions. Each question carries 5 marks.

13. Explain the motion of a pendulum in a car from the point of view of a passenger in the car and from an inertial frame outside car.

14. Derive a relation for the deflection of body of mass m dropped from a height h at the equator.

15. How can we reduce a two body problem to a one body problem?

16. The mean distance of Mars from the Sun is 1.524 times that of the earth from the sun. How many years would be required for Mars to make one complete revolution around the sun?

17. A mass of 10 kg falls 50 cm onto the platform of a spring scale, and sticks. The platform eventually comes to rest 10 cm below its initial position. The mass of the platform is 2 kg. Find the spring constant.

18. Write down the equations for a wave travelling in the +x direction and -x direction. Justify your answer.

19. A wave pulse is given by the equation $(y(x,t) = p^3/(p^2 + (x - vt)^2))$. Obtain the transverse velocity of the pulse.

(Ceiling: 30 Marks)

Part C (Essay questions)

Answer any *one* question. The question carries 10 marks.

20. Obtain an expression for orbits of objects around the sun. What is the condition for the orbit to be hyperbolic?

21. Show that only under the action of damping force, (i) the velocity of a particle decreases exponentially and (ii) its kinetic energy decreases exponentially but with a relaxation time half to that for velocity.

(1 × 10 = 10 Marks)

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