

21U204

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Name:

Reg.No:

SECOND SEMESTER B.Sc. DEGREE EXAMINATION, APRIL 2022

(CBCSS - UG)

(Regular/Supplementary/Improvement)

CC20U PHY2 B02 - MECHANICS - II

(Physics - Core Course)

(2020 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. Define inertial frame and non-inertial frame. Give examples.
2. What are tides and how are they formed?
3. Give an example for a system having both Coriolis force and centrifugal force. Explain the direction of motion due to both.
4. What is the effect of centrifugal acceleration due to earth's spin rotation on acceleration due to gravity?
5. A planet moves faster when it passes close to the sun. Why?
6. What is centrifugal barrier?
7. Write down the differential equation for a simple harmonic oscillator and its standard solution.
8. Write down the equations for potential energy and kinetic energy of a simple harmonic oscillator. Graphically represent the variations in these energies with displacement.
9. What is the relaxation time of a damped harmonic oscillator?
10. Write down the equations for a wave travelling in the +x direction. Justify your answer.
11. What are wave pulses? How are they produced?
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. Suppose a block of mass 0.5 kg is hanging on a string inside an accelerating car. If the acceleration of the car is 1m/s^2 , find the static angle of the string with respect to the vertical direction.
14. Explain the working of Foucault pendulum.
15. Show that in real situations in a central force field, the angular momentum and energy of the actual two particle problem and the equivalent one particle problem are the same.
16. Periods of revolution of the Planets Earth, Mercury and Mars are 365.26, 87.97 and 687.05 days. Find the major axes of the orbits of Mercury and Mars if the major axis of earth is 300×10^6 km.
17. For a forced harmonic oscillator, the amplitude of vibrations increases from 0.02mm at very low frequencies to a value 5mm at the frequency 100Hz. Find (i) Q factor of the system (ii) damping constant k and relaxation time (iii) half width of resonance curve
18. Write down the equations for a wave travelling in the +x direction and -x direction. Justify your answer.
19. Show that for a mechanical wave, the kinetic energy density and potential energy density are equal.

(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 parabolic?
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)
