20U204A   (Pages: 2)   Name: ....

Reg.No: ....

Time : 2.00 Hours   Maximum : 60 Marks

Credit : 2

Part A (Short answer questions)

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

1. Explain how the fictitious force in uniformly accelerating systems acts like gravitational forces

2. What are tides and how are they formed?

3. What is centrifugal force? Give an example.

4. What is meant by non-interacting particles?

5. Write down the relation between energy and eccentricity.

6. What is meant by a bounded and unbounded orbits?

7. Write down the differential equation for a simple harmonic oscillator and its standard solution.

8. What is meant by a forced harmonic oscillator. Give examples.

9. What are the differences between travelling and standing wave?

10. What is characteristics impedance ? Write its expression for transverse waves travelling on a string.

11. What is a pulse?Give example.

12. Differentiate between phase and group velocities.

(Ceiling: 20 Marks)

Part B (Short essay questions - Paragraph)

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

13. A stone dropped with zero initial velocity from the top of a 100m high tower at the equator. Calculate the horizontal displacement of the stone due to earth rotation.

14. Explain the working of Foucault pendulum.

15. Calculate the mass of the sun given that the mean distance between the sun and the earth is 1.49x 10^8km, the period of revolution of earth is 365 days and G= 6.67 x 10^{-11}N m^2 kg^{-2}.

16. Calculate the average energy stored in a 20 gm mass attached to a spring and vibrating with an amplitude 1 cm in resonances with a periodic force whose frequency is 20 Hz. If the quality factor of the oscillator be 160, how much energy is dissipated per second

17. A box of 100 gm is attached to one end of a spring, whose other end is fixed to a rigid support. When a mass of 900 gm is placed inside the box, the system performs 4 vibrations per second and the amplitude falls from 2 cm to 1 cm in 15 seconds. Calculate(i) the force constant (ii) the relaxation time (iii) Q of the system.

18. Discuss the kinetic, potential and total energy in a mechanical wave.

19. Explain the superposition of two harmonic oscillations having equal amplitudes,but slightly different frequencies.

(Ceiling: 30 Marks)

Part C (Essay questions)

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

20. What are central forces? Discuss the general properties of motion under central force.

21. Solve the differential equation of damped harmonic oscillator with all cases and discuss in detail the under-damped case

(1 × 10 = 10 Marks)

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