QP CODE: 20101113

20101113

Reg No : .....

Name : .....

B.Sc. DEGREE (CBCS) EXAMINATION, NOVEMBER 2020

Second Semester

Complementary Course - PH2CMT01 - PHYSICS-MECHANICS AND ASTROPHYSICS

(Common for B.Sc Mathematics Model I ,B.Sc Statistics Model I)

2017 ADMISSION ONWARDS

32482E2B

Time: 3 Hours Max. Marks : 60

Part A

*Answer any **ten** questions.*

*Each question carries **1** mark.*

1. What do you mean by the centre of suspension of a compound pendulum?
2. What is the nature of acceleration in uniform circular motion?
3. Define angular displacement. Give its unit.
4. Define the term radius of gyration of a rotating body.
5. Give the expression for moment of inertia of a disc about an axis through its tangent.
6. Draw the frequency response curve of a forced harmonic oscillator.
7. Explain the term “resonance” related to forced harmonic oscillator.
8. Distinguish between longitudinal and transverse waves.
9. What are standing waves?
10. What is the relation between intensity and amplitude of a wave?
11. What is a pulsar?
12. What are the features of a black hole?

(10×1=10)

Part B

*Answer any **six** questions.*

*Each question carries **5** marks.*

13. A simple pendulum has a length of 1 m. Determine the time period of oscillation if it is suspended in a (i) stationary lift (ii) lift falling at a constant velocity of 2 m/s (iii) lift falling at an acceleration

of 2 m/s^2 and (iv) lift rising at an acceleration of 2 m/s^2.

14. In an experiment using Kater's pendulum the distance between the knife edges is 89.28cm. The centre of gravity of the pendulum is 54.4 cm from a knife edge. If the periods of oscillation about the two knife edges are 1.933 s and 1.92 s, determine the value of acceleration due to gravity at the place.

15. State the expression for the moment of inertia of a uniform cylinder of length 'l' and radius 'R' about an axis through its centre and normal to its length. If the above moment of inertia to be minimum, determine the ratio l/ R, when the mass of the cylinder is kept constant and show that the ratio is $\sqrt{3} : \sqrt{2}$.

16. A flywheel of mass 500 kg, radius 1 m makes 500 r p m. Assuming the mass to be concentrated along the rim, calculate the energy of the flywheel.

17. A particle in simple harmonic motion has velocity 10m/s and 7m/s when displacement from mean position are 3cm and 4cm respectively. What is the length of the path?

18. A particle executes simple harmonic motion with amplitude 5 cm and angular velocity 4π. If the initial phase is $\pi/4$, frame the equation of simple harmonic. Find the displacement, velocity and acceleration at t = 2 sec. Find also the period of oscillation.

19. The speed of a car moving very fast is 90 km/hr. The frequency of its horn is 500 Hz. Determine the frequency of the horn heard by a driver in another car travelling at 72 km/hr in the opposite direction (i) before crossing and (ii) after crossing each other. Given that the velocity of sound in air is 340 m/s.

20. Explain the evolution of a protostar to the main sequence star.

21. Discuss the formation of a neutron star.

(6×5=30)

Part C

*Answer any **two** questions.*

*Each question carries **10** marks.*

22. What is uniform circular motion? Prove that, in a uniform circular motion, the tangential acceleration vanishes and only the radial acceleration exists.

23. Calculate moment of inertia of a uniform sphere (i) about a diameter and (ii) about a tangent

24. Discuss the origin of damping. Set up the differential equation for a damped harmonic oscillator. Discuss the different terms involved. Obtain the condition for critically damped, over damped and under damped cases.

25. Sketch an H.R diagram and write down all information that we obtain from it.

(2×10=20)