TB222380W **Reg. No :.....**

Name :.....

B. Sc. DEGREE (C.B.C.S.) EXAMINATION, MARCH 2023

2022 Admissions Regular & 2021 Admissions Supplementary / Improvement And 2020, 2019 And 2018 Admissions Supplementary

SEMESTER II - COMPLEMENTARY COURSE 2 (PHYSICS)

(For MATHEMATICS)

PH2C01B18 - MECHANICS AND ASTROPHYSICS

Time : 3 Hours **Maximum Marks : 60**

Part A

I. Answer any Ten questions. Each question carries 1 mark **(10x1=10)**

1. Write down the one dimensional wave equation. Mention the conditions to be satisfied by a function to represent wave motion.
2. Give examples of two functions that can be used to represent wave motion.
3. State any four differences between mass and weight.
4. List any two phenomena that can be explained by the superposition principle of waves. Compare them.
5. State the SI units of moment of inertia and torque.
6. Give expressions for the velocity and acceleration of a simple harmonic oscillator.
7. Find the ratio of maximum acceleration to the maximum velocity of a particle performing S.H.M.
8. Graphically represent the acceleration-time curve for SHM.
9. Discuss the phase of a harmonic motion.
10. Explain the origin of the term planetary nebulae.
11. In terms of their initial mass, distinguish between white dwarfs and black dwarfs.
12. Write down the typical range of surface temperature of Sun in Kelvin.

Part B

II. Answer any Six questions. Each question carries 5 marks **(6x5=30)**

13. Describe briefly Kater's reversible pendulum.
14. A source of sound moving toward the stationary observer at 20 m/s. The frequency of the source of the sound is 380 Hz. The speed of the sound waves in air is 400 m/s. What is the frequency of the sound waves heard by the observer?
15. Explain the law of conservation of angular momentum.
16. Moment of inertia plays the same role in rotation as mass does in translation. Justify.
17. A disc revolves with a constant acceleration of $5\,radians/cm^2$. If it starts from rest, compute the number of turns it makes in the first 8 seconds.
18. Discuss the condition of critical damping and over damped motion.
19. A particle undergoes SHM of time period 4s and amplitude 8cm. Find the time it takes to travel 3cm from the positive extremity of its oscillation.
20. Write notes on a) pulsars and b) Chandrasekhar limit.
21. Calculate the magnitude difference between two celestial objects having their brightness in the ratio 100.

Part C

III. Answer any Two questions. Each question carries 10 marks **(2x10=20)**

22. Prove that the time period of a compound pendulum is minimum when the length of the pendulum is equal to it's radius of gyration about a horizontal axis passing through its centre of gravity.
23. State and prove the theorems of moment of inertia.
24. Set up the differential equation for a damped harmonic oscillator and obtain its solution. Hence discuss the condition of damped harmonic motion.
25. Narrate the birth and evolution of stars.