B. Sc DEGREE END SEMESTER EXAMINATION - JULY 2021
SEMESTER 2 : COMPLEMENTARY PHYSICS FOR B Sc MATHEMATICS
COURSE : **19U2CPPHY03 : MECHANICS AND ASTROPHYSICS**
(For Regular - 2020 & Improvement / Supplementary 2019 Admission)

Time : Three Hours   Max. Marks: 60

PART A
Answer any 8 (2 marks each)

1. Give two advantages of a compound pendulum over simple pendulum?

2. A uniform meter scale is of mass 120 g. What is its M.I if the scale is rotated about an axis perpendicular to its length and passes through a) the center and b) the 75 cm mark.

3. A metre stick half of which is wood the other half is steel is made to rotate. About which end will it have maximum M.I? Why?

4. Write down the differential equation of a damped harmonic oscillator. Explain the different terms.

5. Plot the displacement vs time graphs of (a)Over damped and (b) Critically damped Oscillator.

6. Plot the displacement vs time graphs of (a)Critically damped and (b) Under damped Oscillator.

7. Give an expression for the frequency of transverse waves in a string.

8. What is superposition principle?

9. What is Doppler effect? Give an expression for the apparent frequency when the source is stationary and the observer is moving.

10. Explain stellar spectra.

(2 x 8 = 16)

PART B
Answer any 6 (4 marks each)

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

12. A uniform meter scale has a moment of Inertia of 0.02 kgm^2 about a transverse axis passing through its center. What is its moment of Inertia about another transverse axis through the 20 cm mark.

13. A diatomic molecule consists of two atoms of masses m_1 and m_2. The two atoms are at a constant distance of y. Calculate the moment of Inertia of the system about an axis passing through the center of gravity of the system and perpendicular to the line joining the atoms.

14. A particle executes SHM of period 5s. Its velocity is found to be 4cm/s after 0.8 sec it has crossed the mean position. Calculate its velocity when the displacement is 2.5 cm.

15. A particle executing SHM has a maximum velocity of 30 cm/s and maximum acceleration of 60 cm/s^2. Find its amplitude and frequency.

16. A note produces 4 beats per second with a tuning fork of frequency 512 Hz and 6 beats per sec with a tuning fork of frequency 514 Hz. Find the frequency of the note.

17. A plane wave of frequency 256 Hz and amplitude 10 -3 mm is produced in air. Calculate the energy density and energy flux of the wave. Given the density of air = 1.29 Kg m^{-3} and the velocity of sound wave in air = 332 ms^{-1}.

18. A particle of mass m , moving in a circular orbit of radius r has angular momentum L about the centre. Calculate the kinetic energy interms of L, m, and r.

(4 x 6 = 24)

PART C
Answer any 2 (10 marks each)

19. Discuss an experiment to determine the acceleration due to gravity using an asymmetrical compound pendulum.

20. What is a flywheel. Explain its working and theory.

21. Prove that the average value of Kinetic energy of a harmonic oscillator is a constant.

22. Explain the evolution of a star.

(10 x 2 = 20)