B.Sc DEGREE (CBCS) REGULAR / REAPPEARANCE EXAMINATIONS, DECEMBER 2021

Second Semester

Complementary Course - PH2CMT01 - PHYSICS-MECHANICS AND ASTROPHYSICS

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

2017 ADMISSION ONWARDS

65E5030E

Time: 3 Hours   Max. Marks : 60

Part A

*Answer any **ten** questions.*

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

1.   What is force? How is it related to the acceleration of a body?

2.   What do you mean by the term centre of oscillation of a compound pendulum?

3.   Define torque. Express it in terms of moment of inertia of a rigid body.

4.   State parallel axes theorem.

5.   Give the expression for moment of inertia of a disc about its diameter.

6.   Define period and frequency. How are they related?

7.   What are the necessary conditions for simple harmonic motion?

8.   What is the acceleration of a particle executing simple harmonic motion terms of displacement and frequency? What is its direction?

9.   What is the condition for amplitude resonance?

10. What is Beat frequency?

11. What is the main source of Sun's energy?

12. What are white dwarfs?

(10×1=10)

Part B

*Answer any **six** questions.*

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

13. A mass of 0.5 kg is attached to the end of a string of length 1 m and is whirled in a horizontal circle with a uniform speed of 10 m/s. Determine the centripetal force acting on the bob.

14. Calculate the moment of inertia of an annular disc of mass 200g, about an axis passing through the center and perpendicular to its plane. Given that outer radius = 15cm and inner radius = 10cm.

15. Two thin discs each of mass 0.1 kg and radius 0.05 m are placed at either end of a rod 0.2 m long and 0.01 m in diameter. What is the moment of inertia of the system about an axis passing through the centre of the rod and perpendicular to its length? Density of the material of the rod is 7800 kg/m3.

16. Calculate the M.I of a cylinder of length 2m, radius 5cm and density 4 x 103kg/m3about (i) the axis of the cylinder (ii) an axis passing through the centre and perpendicular to its length.

17. A particle of mass 20 gm executes Simple Harmonic Motion of amplitude 2 cm. If the time period is 20 s, find the total mechanical energy of the system.

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

19. A boy standing by the road side blows a whistle of frequency 500 Hz. A cyclist passes the boy at a speed of 5 m/s. Calculate the apparent pitch of the sound heard by the cyclist before and after crossing the boy.

20. Write short note on apparent and absolute magnitude of stars.

21. A star will appear blue or red, if the wavelength of maximum emission from it is in the range 450 to 490 nm or 620 to 770 nm, respectively. Calculate the range of temperature corresponding to the cases in which the star appears blue or red. Given the Wein's constant is 2898 × 10-6mK.

$(6×5=30)$

Part C

*Answer any **two** questions.*

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

22. Discuss how a Kater's pendulum can be used to determine the acceleration due to gravity at a place.

23. Derive the expression for the moment of inertia of a fly wheel

24. What do you mean by a plane progressive wave? Obtain an expression for the energy density of a plane progressive wave

25. At what point does a proto star become a star? Why?

(2×10=20)