LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – **PHYSICS**

SECOND SEMESTER – **APRIL 2015**

PH 2955 - ASTROPHYSICS

Date : 23/04/2015 Dept. No. Max. : 100 Marks

Time : 01:00-04:00

PART A

Answer ALL questions **(2x10 = 20 marks)**

1. Show with a diagram the coordinates of the galactic system on the celestial sphere
2. State and explain the relation between the magnitudes of two stars with their luminosities.
3. What is the significance of HR diagram?
4. What is a binary star? How are binary stars classified?
5. Explain the free transition in the mechanism of opacity in the stellar atmosphere.
6. What is the homologous model of main sequence stars?
7. Explain with a neat diagram the depletion of hydrogen in stars with convective core.
8. What is nuclear time scale?
9. Outline the study of helioseismology.
10. Write a short note on equilibrium theory of nucleosynthesis.

PART B

Answer any FOUR questions **(4 x 7.5 = 30 marks)**

11. Describe the local equatorial system of coordinates for a star.
12. Obtain the relation between the spectrophotometric gradient and the colour temperature of two stars
13. Derive thefundamental equations of stellar structure.
14. Obtain the Schoenberg-Chandrasekhar limit for the isothermal core.
15. Write a short note on the effect of hydrogen depletion in stars
16. Outline the comprehensive theory of nucleosynthesis with specific reference to first generation stars and second generation stars.

PART C

Answer any FOUR questions **(4 x 12.5 = 50 marks)**

17. Explain the trigonometric parallax and cluster parallax of a star
18. a.Show how Saha's equation leads to the determination of $T_{ion}$for stars in thermodynamic equilibrium
    b. Discuss the relationships among stellar parameters for main sequence stars.
19. Obtain the Emden's equation for polytropic index n and discuss its solution for n= 0, 1 and 5.
20. State and prove the virial theorem and explain its application to an isothermal gas sphere.
21. Write and explain the CN cycle of reactions and pp cycle of reactions and explain.
22. (i) Explain in detail the photoelectric method to determine the apparent luminosity of stars
    (ii) How is the electron temperature determined from Maxwell's law of distribution of velocities?

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