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M. Phil. EXAMINATION, 2015

PHYSICS

Paper Third

(Astronomy and Astrophysics)

Time : Three Hours] [*Maximum Marks : 100*

Note : Attempt *five* questions in all, selecting *one* question from each Unit.

Unit—I

1. (a) Write short note on celestial sphere, right, ascension, declination, universal time, sideral time and Julian date. Provide sketches wherever necessary. 10

   (b) Define magnitude system and parsec. What do you mean by apparent and absolute magnitude ? How are they related with each other ? 10

2. (a) Describe the evolution of main sequence stars. Explain how the evolution and end product depend on the initial mass of the star. 10

   (b) Write short notes on the following : 5 each

   (i) X-ray binaries

   (ii) Supernavae, characteristics of its different types.

Unit—II

3. (a) Discuss synchrotron radiation from a single and ensemble of electrons, with necessary mathematical derivations. 13

   (b) Discuss polarization and self absorption of synchrotron radiation. 7

4. (a) Discuss Thomson scattering, Compton scattering and inverse Compton scattering. Explain their importance in astrophysical sources. 13

   (b) Derive expression for power from single Compton scattering. 7

Unit—III

5. (a) Discuss methods of detection of dust and gas. 10

   (b) Discuss different optical manifestation of Gaseous Nebulae. How do you define stromgren sphere ? Derive expression for radius of stromgren sphere. 10

6. (a) Explain the effect of ISM on the electro-magnetic radiation reaching to the observer. Describe in brief the main processes involved. 10

   (b) Discuss planetary nebulae and supernova remnants. 10

Unit—IV

7. (a) Explain morphological classification of galaxies. 5

   (b) Describe the difference between elliptical and spiral galaxies, highlighting the following— surface brightness, kinematics, stellar content, star formation rate, age, and ISM content. 15

8. (a) What is meant by surface brightness ? Why is it considered as a better way of representing light distribution in galaxies ? 5

   (b) Discuss correlation among global parameter and scaling laws, giving emphasis to Faber Jackson relation and fundamental plane. 15

Unit—V

9. (a) What are active galaxies ? How are they different from normal galaxies ? 5

   (b) Describe different classes of AGNs. Discuss the unified model of AGN and explain how it is successful in explaining different types of AGN. 15

10. Discuss the Broad Line Region (BLR) of AGNs under the following heads : broad line spectra, basic parameters and photoionization of BLR. 20