PG Even Semester Examination, May 2025

PHYSICS

(4th Semester)

Course No.: PHY-404A

(Astrophysics-II)

Full Marks: 70

Pass Marks: 28

Time: 3 hours

The figures in the right margin indicate full marks for the question.
Answer any five questions selecting one from each unit.

UNIT-I

1. (a) Discuss about the features by which synchrotron readiation can be distinguished from black body radiation?

   (b) Give examples of astronomical sources which generate these two types of radiation.

   (c) Derive the expression for power radiated by an accelerated charged particle. 2+2+10=14

2. (a) Derive the expression for wave length shift in case of compton and inverse compton scattering.

   (b) What is Bremsstrahlung radiation? Gve a few examples when it is emitted in astronomical situations. 10+4=14

UNIT-II

3. (a) With the help of a diagram describe the structure of milky way.

   (b) What is Dark matter? Describe how its amount can be estimated in our galaxy.

   (c) Suggest the possible composition for Dark matter and justify your answer. 4+8+2=14

4. (a) Describe Hubbles scheme for morphological classification of external galaxies.

   (b) What are AGNs? What are the main differences between AGNs and normal galaxies.

   (c) Discuss about the sources of energy for AGNs. 6+6+2=14

UNIT-III

5. What is 'parallel transport'? Derive the covariant derivative of a tensor of rank 1. Hence show that

   $Dg_{ik}=0$

   Also derive a relation between Christoffel symbol and metric tensor. 2+3+4+5=14

6. State and derive the equation of motion of a body moving through a gravitational field using covariant derivative. Derive the Hamilton-Jacobi equation for the above body. 10+4

UNIT-IV

7. Write notes on (any two) 7+7=14

   (a) Expansion of universe

   (b) Big Bang Model

   (c) Cosmic Microwave Background Radiation

8. Derive a metric which can describe a homogenous and isotropic universe. 14

UNIT-V

9. What is 'dark energy'? Why it is termed so? Describe the role of 'dark energy' in deciding the fate of the universe. 14

10. Classify different types of supernova. What is a standard candle? Explain how the observation of type IIA supernovae signals that the expansion of the universe is getting accelerated in present epoch. 5+2+7=14

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