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Your Roll No.....

2605

M.Sc./III Sem. E

PHYSICS

(Group A) Course XII (*h*)—Part I

(Astrophysics)

Time : 3 *Hours* *Maximum Marks* : 50

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt *All* questions.

1. (*a*) Describe the horizon (alt – az) system of coordinates. Discuss its drawbacks.

(*b*) Derive the appropriate formulae to convert from horizon to equatorial (RA – dec) system of coordinates.

(*c*) The most northerly star of the southern cross, γ crucis has declination 57°. At what latitude will it be just visible ? 3,4,3

2. (*a*) Using Newton's form of Kepler's third law, how can one find the masses of the components of a visual binary system ?

(*b*) Discuss the salient spectral features of stars with spectral types O–M.

P.T.O.

(c) Sketch the HR diagram of globular cluster M13 and discuss the :

(*i*) main sequence;

(*ii*) turn-off point, and

(*iii*) horizontal branch. 4,3,3

3. (*a*) Describe the Babcock model for the formation of sunspots.

(*b*) What does the butterfly diagram tell us about the formation and evolution of sunspots ? 5,5

Or

Discuss the temperature profile of the solar atmosphere.

4. Assuming coronal outflows to be steady, spherically symmetric and isothermal, derive Parker's equation for the speed of the solar wind. Discuss all the plausible solutions. 10

5. (*a*) Show that for an isotropic radiation field, the net flux of energy through a surface element $d\sigma$ is zero.

Or

Consider a pencil of radiation of intensity I_ν impinging upon a surface element $d\sigma$ at an angle θ to the normal to $d\sigma$. Derive an expression for the radiation pressure for the radiation field.

(*b*) Discuss the concept of local thermodynamic equilibrium in the interior of a star. 6,4