**ST. JOSEPH’S COLLEGE (AUTONOMOUS), BANGALORE-27**

**Date: 01-07-2019**

**B.Sc. PHYSICS: VI- SEMESTER**

**Special Supplementary Examination, JUNE 2019**

**PH 6215 – Astronomy, Astrophysics and Nuclear Physics**

Supplementary candidates only.

**Time- 2 ½ hrs Max Marks-70**

**This paper contains two printed pages and three parts**

**PART A**

Answer any **four** of the following. Each question carries 10 marks. (4 x10 = 40)

1. a) Mention the features and advantages of radio astronomy in exploring the universe.

b) Write any two merits of reflecting telescope . Draw and describe Newtonian type of      reflecting telescope. (4+6)

2. a) Explain the term ‘Luminosity’ of a star. Write its unit.

b) Explain Wien’s law and Stefan’s law in determining the surface temperature               and size of a star and hence calculate surface temperature and size(radius) of sun.                                                                                                                                  (2+8)

3. a) Derive the expression for mean particle energy in a star.

          b) Write the conditions for a stable star. Arrive at the expression for Hydrostatic               equilibrium. (4+6)

4. a) Draw H-R diagram and mention important features.

         b) Explain the evolution of sun like stars. (5+5)

    5. a) Write any three characteristics of nuclear forces.

     b) Give the theory of successive disintegration and obtain an expression for secular              equilibrium. (3+7)

6. a) Explain the principle of GM counter with the help of a neat diagram.

     b) Explain the terms quenching and dead time. (6+4)

**PART B**

Solve any **four** of the following. Each problem carries 5 marks. (4 x 5 = 20)

Solar mass MΘ = 2 x 1030kg, Gravitational constant G = 6.67 x 10-11 SI units.

1parsec = 3.09 x 1016m, velocity of light C = 3 x 108m/s, LΘ = 3.9 x 1026J/s

Wien’s constant = 0.0029m/K, Stefan’s constant σ = 5.67 x 10-8 W/m2/k4

7. If a variable star doubles its light output, how much does its magnitude change?. If the     parallax of the star is 0.25 arcsec, calculate its distance from earth.

8. If the gravitational binding energy of a 3solar mass star as per constant density model is

    - 3.8447 X 1041J, calculate its radius. If the total power generated by the star is supplied by        its gravitational potential energy only, calculate its life time. Luminosity of the star is 3LΘ

9. A star in the galaxy has a radius 9 parsec and an orbital speed of 250 km/s. Determine the     mass of the galaxy in terms of solar mass unit. If a blackhole exists at the centre of the     galaxy, determine its Schwarzschild radius.

10. A quasar has an emission line identified as LY-α of hydrogen (λ0 = 121.6nm) and is       observed at 212.8nm. Calculate the distance of the quasar. Hubble constant is 50km/s-Mpc.

11. At a certain instant, a piece of radioactive material contains 1012 atoms. Half life of the       material is 30 days.

     a) calculate the number of disintegration in the 1st sec.

     b) What time will elapse before 104 atoms remain?

12. When 100gm of 3Li7 gets bombarded by a proton, it gets converted into 2He4 and energy is       released. Write down the nuclear reaction and calculate the total energy released.

      Masses of 3Li7 = 7.0183amu, 2He4 = 4.0040amu, 1H1 = 1.0081amu,

     Avagadro No. = 6.02 x 1026/kmole

**PART C**

13. Answer any **five** of the following. Each question carries 2 marks. (5 x 2 = 10)

a) Why are gamma rays more dangerous than radio waves. Justify your answer.

b) A girl is standing on earth and is looking at the sun. Which layer of the sun is she able to      see? Give reason.

c) Star Sirius is found to have spectral lines which are blue shifted. What does this tell us about     the star Sirius?

d) The stars shine in the sky but not the planets. Give reason.

e) How do you calculate nuclear spin number?. Explain.

f) Even though quarks are having fractional charges, explain the conservation of charge in the    formation of protons and neutrons.

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