2023/06

B.Sc. PHYSICS
SIXTH SEMESTER
ASTRONOMY & ASTROPHYSICS
BSP – 604A
[USE OMR FOR OBJECTIVE PART]

SET
A

Duration: 3 hrs.

Full Marks: 70

(Objective)

Time: 30 min.

Marks: 20

Choose the correct answer from the following:

1×20=20

1. The star Procyon falls into which spectral class?
   a. A
   b. O
   c. F
   d. K

2. Which of the following is a red supergiant?

   a. Sirius B
   b. Proxima Centauri
   c. Betelgeuse
   d. Vega

3. Gliese 570, a quaternary star system, falls into which constellation?
   a. Libra
   b. Pisces
   c. Andromeda
   d. Sagittarius

4. What is the order of Sun's diameter?
   a. $10^2\ km$
   b. $10^6\ km$
   c. $10^4\ km$
   d. $10^8\ km$

5. The spectral class K has a temperature range of about?
   a. $2000\ K - 3000\ K$
   b. $5000\ K - 6500\ K$
   c. $3500\ K - 4500\ K$
   d. $6000\ K - 8000\ K$

6. At what distance is our solar system located from the center of the Milky Way?
   a. $8\ kpc$
   b. $8.5\ kpc$
   c. $8\ pc$
   d. $7.5\ kpc$

7. The luminosity of a main sequence star is 10 times that of the solar luminosity. What is the mass of the star in solar units?
   a. $1.93 M_\odot$
   b. $1.5 M_\odot$
   c. $1.85 M_\odot$
   d. $1.8 M_\odot$

8. How will the luminosity of a star change if its mass is increased from $3M_\odot$ to $7M_\odot$?
   a. 29.4
   b. 19.4

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c. 18.4   d. 9.4

9. 1 parsec is equal to how many light years?
   a. 4.5   b. 3.26
   c. 2.36   d. 5

10. HR Diagram is a plot between which quantities?
    a. Luminosity v/s Temperature   b. Temperature v/s Spectral class
    c. Mass v/s Luminosity   d. Density v/s Luminosity

11. Which of the following statements is false?
    a. The shape of the elliptical galaxies is determined from the random orbits of their stars.
    b. The gravitational field within an elliptical galaxy comes from a single central object.
    c. The shape of an elliptical galaxy is determined by the orbital speeds of the stars in it.
    d. Some of the elliptical galaxies are round while others are elongated.

12. The sun's core has a density of about -----?
    a. $150\ gm\ cm^{-3}$ b. $170\ gm\ cm^{-3}$
    c. $190\ gm\ cm^{-3}$ d. $120\ gm\ cm^{-3}$

13. The temperature of the corona is about---?
    a. 10^3 to 10^5 K   b. 10^{10} to 10^{12} K
    c. 10^4 to 10^5 K   d. 10^5 to 10^6 K

14. Which conservation principle is used to explain the evolution of the solar system?
    a. Linear Momentum   b. Energy
    c. Angular Momentum   d. Mass

15. Magnifying power of a telescope is defined as ---?
    a. f_e/f_0 b. f_0/f_e
    c. f_{e+1}/f_0 d. f_e/f_{0+1}

16. The resolving power of a telescope is given by ---?
    a. $\dfrac{d}{\lambda}$ b.

    c. $\dfrac{d}{1.22\lambda}$ d.

17. Whirlpool is what kind of galaxy?
    a. Spiral
    b. Elliptical
    c. Irregular
    d. Lenticular

18. Approximately how many days do the Sun's poles take to complete one rotation?
    a. 25
    b. 28
    c. 38
    d. 30

19. The energy of the solar wind particles lies in the range --?
    a. 0.5 to 10 KeV
    b. 0.1 to 4 KeV
    c. 10 to 20 KeV
    d. 1 to 5 KeV

20. What is the name of the Indian solar mission?
    a. Parker Solar Probe
    b. Aditya L1
    c. Ulysses
    d. Solar Orbiter

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[3]

(__Descriptive__)

Time : 2 hrs. 30 mins.   Marks : 50

[Answer question no.1 & any four (4) from the rest]

1. Explain Hubble's Tuning Fork diagram and describe how galaxies attain their shapes.   7+3=10

2. Explain in detail the rotation curve of galaxies and dark matter.   10

3. Draw the schematic diagram of the Sun with proper labeling of its various layers, prominences, granules etc.   10

4. Explain stellar evolution with proper schematic diagram.   10

5.   i. Sirius has a visual magnitude of -1.44 and a parallax of 379.21 m.arc.sec.   1+4+5 =10
        a. Find its distance in parsec.
        b. The temperature of Sirius is approx. 9500K. What is the radius of the star in solar units?
     ii. Write a short note on James Webb Space Telescope.

6. Explain the parallax method and find out the radius of the Sun using the method. Draw the HR diagram and explain it briefly.   5+5=10

7.   a. What is a solar cycle, solar maxima and solar minima?   2+6+2 =10
     b. Explain what are sunspots and how they prove the solar rotation.
     c. What is a solar dynamo, solar prominence and solar flares?

8.   a. Using Stefan- Boltzmann law, find out the temperature of the Sun.   3+3+4 =10
     b. A pressure of 10^3 Pa prevails in the solar atmosphere. What should be the strength of the magnetic field required to balance such a pressure?
     c. The temperature inside a sunspot is 4000 K and that of its surface is 6000 K. Calculate the strength of the magnetic field inside the sunspot which will balance the pressure inside and outside.

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