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**M.Sc. (THIRD SEMESTER)
EXAMINATION, Dec. - Jan., 2021-22**

Physics

Paper (iv) (A)

Astronomy and Astrophysics - I

[Time : Three Hours]

[Marks : 80]

Note : Attempt all sections as directed.

PART - A

(Objective type questions) (each 1×20=20 marks)

1. A good human eye can see a star of magnitude
- (a) 0
 - (b) 2
 - (c) 6
 - (d) all of the these

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2. An eclipsing binary will be detected if it's orbital plane is-
- (A) 90 degree to the line of sight i.e. in face on view.
 - (B) 0 degree to the line of sight i.e. in edge on view
 - (C) 270 degree to the line of sight i.e. in inverse face on view
 - (D) All of these.
3. The spectral classification of stars by A. J. Canon is a sequence of _____
- (A) Core temperature
 - (B) Surface temperature
 - (C) Broadening of lines
 - (D) luminosity of stars
4. Supernova remnant will host a
- (A) White dwarf
 - (B) Black dwarf
 - (C) Neutron star
 - (D) Quasar
5. Two stars P and Q have spectral class K4V and F5111, respectively
- (A) P is hotter and larger than Q
 - (B) P is cooler and larger than Q
 - (C) P is cooler and smaller than Q
 - (D) P is hotter and smaller than Q

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6. A star of 6.5 solar mass will die as a
- (A) Supernova
 - (B) White dwarf
 - (C) Black hole
 - (D) Neutron star
7. In a visual binary system, semi-major axis of stars A and B are 3" and 10", respectively. The ratio of the masses M_A/M_B is
- (A) 3
 - (B) 0.3
 - (C) 0.33
 - (D) 0.03
8. In a White Dwarf, gravitational contraction is balanced by
- (A) Gas Pressure
 - (B) Electron degeneracy pressure
 - (C) Neutron degeneracy pressure
 - (D) Radiation pressure
9. Life time of a Sun like star is
- (A) 10 Gyr
 - (B) 5 Gyr
 - (C) 1 Gyr
 - (D) 1 Myr

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10. The luminosity class in MK spectral classification is based on
- (A) Strength of line
 - (B) Surface temperature
 - (C) Broadening of lines
 - (D) Core temperature
11. First star is 2 solar mass and second star is 4 solar mass -
- (A) First star will die first because it has less mass and less hydrogen
 - (B) Second star will die later because it has more mass and more hydrogen
 - (C) Both will die at similar time because they are low mass stars
 - (D) Second will die first because it will evolve fast.
12. First white dwarf is 1 M solar mass, second white dwarf is 1.3 solar mass .
- (A) First white dwarf will be smaller in size
 - (B) Second white dwarf will be bigger in size
 - (C) First white dwarf will be bigger in size
 - (D) Both will be equal in size because of Chandrasekhar limit .

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13. A Neutron Star will get a stable structure because of
- (A) Gas pressure
 - (B) Radiation pressure
 - (C) Degeneracy pressure
 - (D) Pressure due to heat energy
14. A star spends its maximum life time in main sequence phase due to
- (A) H burning
 - (B) He Burning
 - (C) C burning
 - (D) Fe burning
15. Surface Temperature of a star is 25000 K⁰ its colour index will be
- (A) +ve
 - (B) -ve
 - (C) zero
 - (D) +2.5 mag
16. Which among the following has the highest energy conversion efficiency?
- (A) Fusion of H into He
 - (B) Accretion onto a Black Dwarf
 - (C) Accretion onto a White Dwarf
 - (D) Accretion onto a Neutron star

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17. Supernova type Ia originates
- (a) From the core collapse of a star
 - (B) From an accreting WD
 - (C) From an accreting NS
 - (D) From a WD-NS merger
18. What is the primary source of energy for main sequence phase of stars like the sun?
- (A) Thermal
 - (B) Gravitational
 - (C) Nuclear Fusion
 - (D) Nuclear Fission
19. The visible photons come from which part of the sun?
- (A) Photosphere
 - (B) Transition region
 - (C) Corona
 - (D) None of these
20. A Neutron star can have mass approximately
- (A) Less than 0.1 M
 - (B) Less than 3 M
 - (C) More than 4 M
 - (D) More than 20M

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PART - B

Very Short Answer type questions

(2 × 8 = 16)

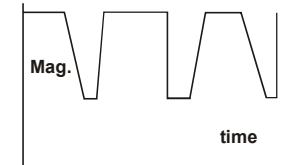
1. How can age of a star cluster be determined through HR diagram?
2. Give reason, why does energy generation in sun like star take place via PP chain while in massive stars it's mainly by CNO cycle?
3. Explain why a Neutron Star can rotate with a high spin rate~1rot/sec. Can stars like Sun rotate with such a fast spin?
4. Why can a neutron star not have mass greater than 2-3 solar mass?
5. Why do sunspots have lower temperature?
6. Why is orbital speed of inner ring greater than the outer ring?
7. What are the variable stars? Why are they important in Astronomy?

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8. A graph is shown below. What is this graph called in astronomy? Write name of the object related to this graph. Based on the graph, comment on the characteristics of the objects e.g. mass/brightness.



Part - C

(Short Answer Type Questions)

(3 marks each)

1. Define apparent magnitude, absolute magnitude and colour index? Write some formulae (do not derive) for these parameters and give some examples.
2. Write some characteristics of HR diagram. State its importance in Astronomy.
3. Explain why a Neutron Star possesses tremendous magnetic field.
4. Derive the Kepler's 3rd law from the Newton's law.
5. How can you estimate mass of the Saturn? Give some idea to find mass of the Sun on similar ground.

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6. What is the Doppler Effect? Write formula for the Doppler velocity. Why is it important in Astronomy?
7. State the Kepler's laws of motion.
8. Why is a minimum mass required to form a star? Why can not a star be formed above a certain mass? Write approximate values of minimum and maximum mass of a star.

Part - D

(Long Answer Type Questions)

(5 marks each)

1. How are the distances of astronomical objects determined? Write down some methods and explain any two.

or

Discuss the evolution of low mass stars with the help of HR diagram.

2. Explain first two equations of stellar structure and get an expression for Virial theorem from these.

or

What are the Binary stars? Discuss their classification.

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3. Derive an expression for electron degeneracy pressure.

or

What is Chandrasekhar mass limit? Derive an expression for it.

4. Discuss any one phenomenon related to sun.

or

Write down a note on Neutron star or Supernova explosion