NS – 288

V Semester B.Sc. Examination, November/December 2016
(CBCS/NS, 2013-2014 and Onwards) (F & R)
PHYSICS – VI
Astrophysics, Solid State Physics and Semi-conductor Physics

Time : 3 Hours Max. Marks : 70

Instruction : *Answer* ***five*** *questions from* ***each*** *Part.*

PART – A

Answer **any five** of the following questions. **Each** question carries **eight** marks. **(5×8=40)**

1. a) Write a note on Yerke's luminosity classification of stars.
   b) Obtain an expression for core pressure of a star on the basis of Linear density model. **(3+5)**

2. a) What is Chandrashekar's mass limit ?
   b) Write a note on H – R diagram, White dwarfs and black holes. **(2+6)**

3. a) What are X – rays ?
   b) State and explain Moseley's law, Mention its applications. **(2+6)**

4. a) State Wiedemann – Franz law.
   b) Derive an expression for electrical conductivity of a metal based on free electron theory. **(2+6)**

5. a) What is Hall effect in metals ?
   b) Explain any three experimental facts about superconductivity. **(2+6)**

6. Obtain an expression for electron concentration in conduction band of Intrinsic semiconductor. **8**

7. a) Distinguish between Conductors, Semiconductors and Insulators on the basis of band theory of solids.
   b) Write a note on LED and Solar cell. **(3+5)**

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8. a) Explain h-parameters with the help of two port Linear network.

   b) Derive an expression for current gain in a CE amplifier in terms of h-parameters. **(4+4)**

PART – B

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

9. The apparent magnitudes of the stars Sirius and the Regulus are – 1.44 and + 1.36 respectively on magnitude scale of stars. Calculate the relative brightness of the star Sirius with respect to Regulus.

10. As per linear density model of a star, calculate gravitational potential energy of a star. Given $R = 7 \times 10^8$ m, $M = 3 \times 10^{30}$ Kg and $G = 6.673 \times 10^{-11}$ $Nm^2 Kg^{-2}$.

11. Calculate the radius of a neutron star whose mass is $2 M_\odot$.

12. In a crystal, a plane cuts intercepts of 3a, 2b and 6c along the three crystallographic axes. Determine the Miller Indices of the plane.

13. Calculate the fermi energy of Lithium. Given density of Lithium is 534 Kg m^{-3} and atomic weight is 6.931 amu (Given 1 amu = 1.667×10^{-27} Kg).

14. Monochromatic X – rays of wavelength 0.15 Å undergo Compton effect from a carbon block. Calculate the wavelength of scattered rays through 45°.

15. Mobilities of electrons and holes in a sample of intrinsic germanium at 300 K are 0.36 $m^2 v^{-1} s^{-1}$ and 0.17 $m^2 v^{-1} s^{-1}$ respectively. If the resistivity of the specimen is $2.12\ \Omega m$. Calculate the carrier concentration in intrinsic semiconductor.

16. A certain regulator has a no-load output voltage of 20v and has a full-load output of 19V. What is the load regulation expressed as a percentage ?

PART – C

Answer **any five** of the following questions. **Each** question carries **two** marks. **(5×2=10)**

17. a) Is there any mass limit for black holes ? Explain.

b) How do white dwarfs attain stability ? Explain.

c) Is there any unmodified line in Compton scattering ? Explain.

d) Hall coefficient is negative for metals. Why ?

e) Does characteristic spectrum of X – rays depend on the applied voltage ? Explain.

f) An intrinsic semiconductor behaves like a perfect insulator at 0K. Explain.

g) Are there any holes in n – type semiconductor ? Explain.

h) Why is β more than α of a transistor.
