

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. (3+5)
b) Obtain an expression for core pressure of a star on the basis of Linear density model.
2. a) What is Chandrashekar's mass limit ? (2+6)
b) Write a note on H – R diagram, White dwarfs and black holes.
3. a) What are X – rays ? (2+6)
b) State and explain Moseley's law, Mention its applications.
4. a) State Wiedemann – Franz law. (2+6)
b) Derive an expression for electrical conductivity of a metal based on free electron theory.
5. a) What is Hall effect in metals ? (2+6)
b) Explain any three experimental facts about superconductivity.
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. (3+5)
b) Write a note on LED and Solar cell.

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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)

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 $G = 6.673 \times 10^{-11}$ Nm² 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 \AA 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 $0.36 \text{ m}^2 \text{ v}^{-1} \text{ s}^{-1}$ and $0.17 \text{ m}^2 \text{ v}^{-1} \text{ s}^{-1}$ respectively. If the resistivity of the specimen is $2.12 \Omega \text{ m}$. 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 ?



University of Jammu B.Sc. Examination, Nov/Dec, 2018
(Detailed Scheme) (CBCS) (Fresh) (2018-2019 and Onwards)

PART - C

Answer **any five** of the following questions. **Each** question carries **two** marks. (5x2=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.