Roll No. _____ [Total No. of Pages : 3

SVIS 301 A -16

B.Sc. VIth Semester Degree Examination

Physics

(Statistical Physics Solid State Physics and Material Science)

Paper - 6.1

Time : 3 Hours Maximum Marks : 80

Instructions to candidates:

1) Answer all the questions from Section-A
2) Answer any five questions from Section-B and
3) Answer any four questions from Section-C.

Section -A

I. Answer the following questions **(15×1=15)**

1. What is position space?
2. Define Ohm's law.
3. What is intrinsic semiconductor?
4. Define primitive cell.
5. Define valence band.
6. State curie law.
7. Define thin film.
8. Define superconductivity.
9. Define Hall effect.
10. What is diamagnetic substance?

11. What is a transistor?

12. What is lattice constant?

13. Define sputtering phenomenon

14. What are the minority charge carriers in P-type semiconductor.

15. Draw the symbolic diagram of PNP transistor.

Section -B

II. Answer any five of the following. **(5×5=25)**

16. Mention the main difference between classical and quantum statistics.

17. Obtain an expression for thermal conductivity of a conductor.

18. State and explain Bragg's law in X-ray diffraction.

19. Explain the action of PN-junction

20. What is meant by cathodic sputtering? Explain it.

21. State and explain curie-weiss law.

22. State and explain dulong-petit's law in specific heat of solids.

Section -C

III Answer any **four** questions of the following **(4×10=40)**

23. a) What is the minimum size of cell in classical mechanics?

    b) Compare the Maxwell-Boltzman. Bose-Einstien, and Fermi-Dirac statistics. **(2+8)**

24. a) State the Density of states. And obtain expression for it.

    b) Calculate the drift velocity of free electrons in a copper conductor of cross sectional area 10^{-4} m^2 and in which a current of 200 Amp. Flows the free electron density of Cu is 8.5×10^{28}m^{-3}. **(7+3)**

25. a) What do you understand by Miller indices of a crystal plane? Show that the spacing between two consecutive planes defined by miller indices (hkl) is given by

$$d = \frac{a}{\sqrt{h^2 + k^2 + l^2}}$$

b) Find the Miller indices of a set of parallel planes which make intercepts in the ratio 3:4 on X and Y axis and parallel to Z-axis. **(2+5+3)**

26. a) Distinguish between insulator, semiconductor, and conductor based on energy band diagram. **(7+3)**

b) An X-ray tube operates at 100kv. Calculate the shortest wavelength of X-rays.

27. a) Explain the construction and working of solar cell and write its applications.

b) Give Einstien's theory of specific heat of solids. **(5+5)**

28. a) Discuss B.C.S. theory of superconductivity.

b) X-rays of wavelength $0.36A^0$ are diffracted (first-order) at an angle of $4^0\ 48'$ in Bragg's spectrometer. Find the lattice spacing of atomic layers in the crystal. **(6+4)**
