

Total number of printed pages

B. Tech
BSCP 2201

2nd YEAR SUPPLEMENTARY EXAMINATION – 2006



PHYSICS – II

Full Marks – 70

Time : 3 Hours

The figures in the right hand margin indicate full marks for the questions.

Answer questions No. 1 which is compulsory and any five from the rest.

1. Answer all the following questions : 2×10
- (a) What happens to the output voltage of the voltage multiplier circuit used in Cockcroft-Walton accelerator if the capacitors used have low capacitance ?
- (b) Draw the graph showing the variation of output energy with number of drift tubes in a linear accelerator.

- (c) Distinguish between primitive unit cell and unit cell.
- (d) Show the (1 1 0) plane of a orthogonal unit cell in a diagram.
- (e) The ground state energy of hydrogen atom is 13.6eV. Calculate the width of the first forbidden energy gap in hydrogen atom.
- (f) Why in p-type material the number of electrons in conduction band is less than that of holes in valence band ?
- (g) For the flow of electron there must be a potential difference. Name a phenomenon where electron can flow even though there is no potential difference. Who discovered it first ?
- (h) How superconductivity concepts helped US forces in 2003 to destroy Iraqi communication system.

- (i) Why light beam traveling in optical fibers can carry much more information than radio or microwaves?
 - (j) What is the difference between light emitted from LED and light emitted from LD.
2. (a) Prove that the average energy obtainable from betatron is limited by its radius and peak magnetic flux of the applied field. 4
- (b) One of oldest linear accelerators at Berkeley has 46 tubes. If length of the shortest tube is 1.2 meters what will be the length of the longest tube ? 3
- (c) Describe how optical fibers are in use to enhance the living conditions on earth. 3
- 3 (a) What are the factors that determine the performance index of a nuclear accelerator ? 4

- (b) Show that in simple cubic lattice, interplanar spacings of $\{101\}$, $\{110\}$ and $\{011\}$ planes are in the ratio 1:1:1. 4
- (c) Why type-I superconductors are called soft superconductors ? 2
4. (a) What are the interference do you obtain from Kronig-Penney model ? 4
- (b) Calculate the structure factor in case of body centered unit cell. 4
- (c) Under what condition a charge can not be accelerated by using magnetic field ? 2
5. (a) Explain on the basis of BCS theory how superconductivity is affected by temperatures. 4
- (b) A crystal plane makes intercepts 2.93 mm, 4.47 mm and 2.35 mm along three crys-

tallographic axes having lengths 3.05 \AA , 6.99 \AA and 4.90 \AA respectively. Determine the Miller indices of the plane. 4

(c) Distinguish between step index multiple mode optical fiber and graded index multiple mode optical fiber. 2

6. (a) Explain the origin of semiconducting properties in compound semiconductors. 4

(b) Derive an expression for the energy of an electron inside an infinitely deep potential well from Kronig-Penney model. 3

(c) How superconductors can be used in internet and pollution control ? 3

7. (a) Describe different types of pumping mechanisms to achieve population inversion. 4

(b) The critical temperature for some superconducting specimen with isotopic mass

196.5 is 4.18K. Calculate its critical temperature when its isotopic mass changes to 203.4.

4

- (c) Mention four numbers of medical applications of radio isotopes.

2

8. (a) Distinguish between compound semiconductors and elemental semiconductors. What are the advantages of compound semiconductors over elemental semiconductors ?

4

- (b) What are the characteristics of an optical source used in FOCL.

4

- (c) Define reciprocal lattice.

2