

B.sc 6th semester Sessional Examination 2021

Subject : PHYSICS(Major)

Paper: 6.2

Full Marks : 30

Group –A

(Mathematical Methods)

1. Answer the following questions: 1x2=2

- a. Give an example of contravariant tensor of rank 2.
- b. Which of the following is a tensor of rank 0.

i. $\vec{A} + \vec{B}$ ii. $\vec{A} - \vec{B}$ iii. $\vec{A} \cdot \vec{B}$ iv. $\vec{A} \times \vec{B}$

2. Answer the following questions: 2x2=4

- a. Write inner product of the tensor $A_{kl}^j B_{pq}^{nk}$.
- b. Prove that $A^\alpha B_\alpha$ is a scalar or invariant.

3. If a tensor of rank N is contracted 2 times, what would be its final rank ? Obtain a zero rank tensor from the 4th rank tensor R_{kh}^{ij} . 4

Group – B

(Solid State Physics)

4. Choose the correct answer from the following: 1x4=4

a. The number of atoms per unit cell in an f.c.c. lattice is

- i. 1 ii. 2 iii. 3 iv. 4

b. The type of bonding between layers of graphite is

- i. van der Waals ii. Hydrogen bond iii. Ionic iv. Covalent

c. Near to absolute zero temperature, silicon is a/an

- i. Metal ii. Semiconductor iii. Insulator iv. Semimetal

d. The very first super conductor discovered was –

- i. Hg ii. Nb iii. Pb iv. Bi

5. Write the following questions: 2x3=6

- a. What are primitive and non-primitive unit cell?
- b. What are the characteristic properties of covalent solids ?
- c. What is the reason that most of the metals crystallize in f.c.c. form ?

6. Answer any two from the following:

5x2=10

a. What are Miller indices and how are they determined ? What are the Miller indices of faces of a cubic lattice ?

b. Illustrate on ionic bonding of solids ? Write the characteristic properties of ionic bonding .

c. Obtain the values packing fractions of b.c.c. lattices in closed packed structure .