V P & R P T P Science College, Vallabh Vidyanagar – 388120

B Sc [Semester- Vth]

Course Code No: US05CPHY03 Subject: Solid State Physics

Wednesday, Date 03-10-2018 Time: 10.00 am to 12.00 pm

Total Marks-50

Q-1	Multiple Choice Question [Attempt all]				08
1	What is the wavelength of X-ray?				
	(a)	1 A	(c)	1cm	
	(b)	1m	(d)	1nm	
2	Electron diffraction are used to determine				
	(a)	Structure properties	(c)	Surface properties	
	(b)	Strength	(d)	Color of the material	
3	Drude model of free electron theory cannot explain				
	(a)	thermal conductivity	(c)	Not sure	
	(b)	Electrical conductivity	(d)	Electron heat capacity & paramagnetic susceptibility	
4	Type – I superconductor are known as				
	(a)	Soft superconductors	(c)	No name	
	(b)	Hard superconductors	(d)	Only the name	
5	At a equilibrium conditions, the rate of generation of electron-hole pair and rate of recombination are _____ ?				
	(a)	Unpredictable	(c)	Infinite	
	(b)	Same	(d)	Zero	
6	N-type semiconductors can be made using _____ impurity				
	(a)	Tetravalent	(c)	Pentavalent	
	(b)	Divalent	(d)	Trivalent	
7	Nanotechnology is the engineering of the structure less than _____ size				
	(a)	100 nm	(c)	100 Amp	
	(b)	100 Cm	(d)	100 C	
8	The colour of the nano materials changes with the thickness because of				
	(a)	Surface to volume ratio	(c)	Density to volume ratio	
	(b)	mass to electron ratio	(d)	Gravity to volume ratio	

Q-2	Attempt any Five questions in brief.	10
1.	When X-ray diffraction techniques are used.	
2.	When neutron diffraction techniques are used.	
3.	What is band–effective mass?	
4.	What is type-II superconductor?	
5.	What are extrinsic semiconductors?	
6.	What is photoelectric effect?	
7.	What is Nano technology?	
8.	State Moore's first and second law.	

Q-3	(a)	Describe rotating crystal method for determination of crystal structure in detail.	5
	(b)	Explain the geometrical construction of reciprocal lattice.	3
		OR	
Q-3	(a)	Discuss the Ewald construction of X-ray diffraction.	5
	(b)	When electron diffraction techniques are used?	3
Q-4	(a)	Explain the effect of heat capacity on superconductors.	4
	(b)	Discuss the effect of temperature on Fermi-Dirac distribution function.	4
		OR	
Q-4	(a)	Derive the energy levels of free electron using Schrodinger equation in three dimensions.	8
Q-5	(a)	Discuss in detail intrinsic and extrinsic semiconductors.	8
		OR	
Q-5	(a)	Derive necessary equation for free carrier concentration in semiconductors.	8
Q-6	(a)	What is dip pen lithography?	4
	(b)	What is Atomic Force Microscopy?	4
		OR	
Q-6	(a)	What are smart materials?	4
	(b)	What are nano sensors?	4