Seat No.:	Q. Paper Code: FTC-A-025	SET	P

Fabtech Technical Campus, College of Engineering & Research, Sangola

(An Autonomous Institute)

Computer Science and Engineering, Artificial Intelligence and Data Science

Academic Year: -2025-26, Semester-I

Solid State Physics (25UGS11003)

Regular End Semester Examination 2025-26 [Dec./Jan.]

Class:	F. Y. B. Tech.	Day & Date:	Monday, 12/01/2026
Duration:	03 Hrs.	Max. Marks:	60 Marks
Time:	01.30 PM TO 04.30 PM		

Instructions:
1) Q. No. 1 is compulsory. It should be solved in the first 30 minutes in the Page No.3 of the answersheet.
2) Don't forget to mention the question paper set (P/Q/R) on the top of page 3 of the answersheet .

Q. 1	**Multiple Choice Questions (MCQs) Each question carries 1 mark**	Marks: 10	
		CO	**BL**
1	The atomic radius of FCC lattice is (a) $a/2$ (b) $\sqrt{3}a/4$ (c) $\sqrt{2}a/4$ (d) $\sqrt{a}/4$	1	1
2	Co- Ordination Number of BCC crystal is (a) 6 (b) 8 (c) 12 (d) 16	1	1
3	Spontaneous Emission process is mathematically represented by equation (a) $A + h\nu = A^*$ (b) $A^* + h\nu = 2h + A$ (c) $A^* = A + h\nu$ (d) $A^* + h\nu = A + h\nu$	2	1
4	Optical pumping is used in _____laser (a) He-Ne laser (b) Ruby laser (c) Semiconductor diode laser (d) Co2 laser	2	1
5	The Hall coefficient (RH) is for metal (a) Positive (b) Negative (c) No sign (d) Any other	3	1
6	Semiconductor that contains acceptor atoms and holes belongs to the type (a) N (b) P (c) Pure (d) None of above	3	1
7	The principle of the optical fibre is _____ (a) Reflection (b) Refraction (c) Double refraction (d)Total internal reflection	4	1
8	The numerical aperture is given by the equation (a) $NA = \sqrt{(n_1^2 - n_2^2)}$ (b) $NA = \sqrt{(n_1 - n_2)}$ (c) $NA = \sqrt{(n_1^2 + n_2^2)}$ (d) $NA = \sqrt{(n_2^2 - n_1^2)}$	4	1
9	In Type I superconductors, the region above critical magnetic field Hc is called: a) Normal state (b) Meissner state (c) Mixed (vortex) state (d) Critical state	5	1
10	The magnetic susceptibility of paramagnetic substance is a) Small positive (b) 1000 (c) Less than 0 (d) zero	5	1

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3) Draw a neat diagram wherever necessary.
4) Make suitable assumptions if necessary and state it clearly.
5) Use of non-programmable calculator is allowed.

Q. No.	Questions	Marks	CO	BL
Q. 2	**Attempt any two of the following**	**10**		
1	Define atomic packing fraction. Find the atomic packing fraction for SC, BCC and FCC lattice.	5	1	2
2	Define the following terms: i) basis, ii) unit cell iii) co-ordination number. Copper has an FCC structure with lattice constant 3.61 A^0. Calculate the radius of copper atom.	5	1	3
3	Explain the term Miller Indices and the procedure to find Miller Indices. Find Miller indices for the planes having intercepts 3a, 2b, ∞.	5	1	2
Q. 3	**Attempt any two of the following**	**10**		
1	State the term laser. Define: Population inversion, Optical Pumping, Metastable state.	5	2	1
2	Write any two properties of Laser and give any two applications of laser in Engineering and medical field.	5	2	2
3	Explain the term Holography. Write the difference between holography and Photography.	5	2	2
Q. 4	**Attempt any two of the following**	**10**		
1	On the basis of band theory, explain the formation of bands in solids. Define Conduction band, Valence band & forbidden gap.	5	3	2
2	An p - type germanium sample has a donor density of 10^{21}/m^3. It is arranged in a Hall experiment having magnetic field of 0.5 T and the current density is 500 A/m^2. Find the Hall voltage if the sample is 3 mm wide (e =1.6×10^{-19}C)	5	3	3
3	Explain the basic principle of the Hall effect and obtain the relations for Hall voltage and Hall coefficient.	5	3	2

Q. 5	Attempt any two of the following	10		
1	Define the following terms : 1. Acceptance angle 2.Acceptance cone Give applications of dielctric material.	5	4	2
2	Write advantages of optical fiber over ordinary cable and give application of optical fiber.	5	4	2
3	Obtain the expression for acceptance angle, numerical aperture and fractional refractive index change of an optical fiber.	5	4	2
Q. 6	Attempt any two of the following	10		
1	Write properties of a superconductor. A superconductor has a critical magnetic field at 0 K is 7200 A/m. Find its critical magnetic field at temperature T = 4K.	5	5	2
2	Explain type I and type II superconductors.	5	5	2
3	Explain the Meissner effect. Prove that superconductors act as a diamagnetic.	5	5	2

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Q. 1	Multiple Choice Questions (MCQs) Each question carries 1 mark	Marks: 10	
		CO	BL
1	Semiconductor that contains acceptor atoms and holes belongs to the type (a) N　　　(b) P　　　(c) Pure　　　(d) None of above	3	1
2	The principle of the optical fibre is _____ (a) Reflection　　　　　　　(b) Refraction (c) Double refraction　　　　(d)Total internal reflection	4	1
3	The numerical aperture is given by the equation (a) NA = $\sqrt{(n_1^2-n_2^2)}$　　　(b) NA = $\sqrt{(n_1-n_2)}$ (c) NA = $\sqrt{(n_1^2+n_2^2)}$　　　(d) NA = $\sqrt{(n_2^2-n_1^2)}$	4	1
4	In Type I superconductors, the region above critical magnetic field Hc is called: (a) Normal state　　　　　(b) Meissner state (c) Mixed (vortex) state　　　(d) Critical state	5	1
5	The magnetic susceptibility of paramagnetic substance is a) Small positive　　(b) 1000　　(c) Less than 0　　(d) zero	5	1
6	The atomic radius of FCC lattice is (a) a/2　　(b) $\sqrt{3}a/4$　　(c) $\sqrt{2}a/4$　　(d) $\sqrt{a}/4$	1	1
7	Co- Ordination Number of BCC crystal is (a) 6　　(b) 8　　(c) 12　　(d) 16	1	1
8	Spontaneous Emission process is mathematically represented by equation (a) A + hν = A*　　　(b) A* + hν = 2h + A (c) A* = A + hν　　　(d) A* + hν = A + hν	2	1
9	Optical pumping is used in _____laser (a) He-Ne laser　　　　　(b) Ruby laser (c) Semiconductor diode laser　(d) Co2 laser	2	1
10	The Hall coefficient (RH) is for metal (a) Positive　　(b) Negative　　(c) No sign　　(d) Any other	3	1

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2	Define the following terms: i) basis, ii) unit cell iii) co-ordination number. Copper has an FCC structure with lattice constant 3.61 A^0. Calculate the radius of copper atom.	5	1	3
3	Explain the term Miller Indices and the procedure to find Miller Indices. Find Miller indices for the planes having intercepts 3a, 2b, ∞.	5	1	2
Q. 3	**Attempt any two of the following**	**10**		
1	State the term laser. Define: Population inversion, Optical Pumping, Metastable state.	5	2	1
2	Write any two properties of Laser and give any two applications of laser in Engineering and medical field.	5	2	2
3	Explain the term Holography. Write the difference between holography and Photography.	5	2	2
Q. 4	**Attempt any two of the following**	**10**		
1	On the basis of band theory, explain the formation of bands in solids. Define Conduction band, Valence band & forbidden gap.	5	3	2
2	An p - type germanium sample has a donor density of $10^{21}/m^3$. It is arranged in a Hall experiment having a magnetic field of 0.5 T and the current density is 500 A/m^2. Find the Hall voltage if the sample is 3 mm wide (e =1.6×10^{-19}C)	5	3	3
3	Explain the basic principle of the Hall effect and obtain the relations for Hall voltage and Hall coefficient.	5	3	2

Q. 5	**Attempt any two of the following**	10		
1	Define the following terms : 1. Acceptance angle 2.Acceptance cone Give applications of dielectric material.	5	4	2
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