Year and Program: 2018-19	School of Science	Department of Physics
Course Code: PHS502	Course Title: Condensed Matter Physics	Semester – II
Day and Date: Monday, 20th May 2019	End Semester Examination (ESE)	Time: 30min Max Marks: 20 2.30 to 3.00 pm
Seat No.:	PRN No.:	Student Sign:
Invigilator Sign:	Examiner Sign:	Marks Obtained:

Instructions:

1) All Questions are compulsory.
2) Mark √ to the correct option. Do not circle.
3) More than one options marked will not be considered for assessment.
4) Rough calculations on paper are not allowed.
5) Use of non-programmable calculator is allowed.

Q.1		Solve the following questions.	Marks	Bloom's Level	CO
a)		**Select the correct alternative.**			
	1)	Relation between atomic radius r and lattice constant a in the case of SC lattice is ….	01	L_2	502.1
		i) $r = a/2$ ii) $r = (\sqrt{2}/4).a$ iii) $r = 4a$ iv) $r = (\sqrt{3}/4).a$			
	2)	Co-ordination number of FCC lattice is ….	01	L_1	502.1
		i) eight ii) six iii) twelve iv) four			
	3)	Which of the following is weakest bond? i) van der Walls bond ii) metallic bond iii) covalent bond iv) ionic bond	01	L_1	502.2
	4)	Semiconductor have energy band gap of the order of ….. i) about 1-2 eV ii) about 6 eV iii) about 10 eV iv) zero	01	L_1	502.2
	5)	The periodicity of lattice is given by … i) Bloch theorem ii) Plank theorem iii) Lorentz theorem iv) none of these	01	L_1	502.3

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b)   **State whether the given statement is true or false.**

    i)   The planes (112) and (224) are perpendicular to each other.   01 L_4 502.1

    ii)   Ionic bond is formed by transfer of electrons.   01 L_1 502.2

    iii)   Acceptor type impurities are trivalent elements.   01 L_1 502.3

    iv)   The magnetic susceptibility of a diamagnetic material is negative.   01 L_2 502.4

c)   **Fill in the blank.**

    i)   The Miller index of the plane parallel to the z –axis and y- axis is…..   01 L_1 502.1

    ii)   Conductivity of semiconductor …….with temperature.   01 L_1 502.2

    iii)   The periodicity of lattice is given by ……   01 L_1 502.3

    iv)   Hydrogen molecule is example of …..type of dielectric material.   01 L_2 502.4

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SGU	**Sanjay Ghodawat University, Kolhapur**	2018-19
	Established as State Private University under Govt. of Maharashtra. Act No XL, 2017	EXM/P/09/01
Year and Program: 2018-19	School of Science	**Department of Physics**
Course Code: PHS502	**Course Title: Condensed Matter Physics**	Semester – II 3 to 5.30 pm
Day and Date: Monday, 20th May 2019	**End Semester Examination (ESE)**	Time: Max Marks: 80

Instructions: 1) All questions are compulsory.
2) Use of scientific calculator is allowed.
3) Figures to the right indicate full marks.

			Marks	Bloom's Level	CO
Q.2		**Solve the following questions.**			
	a)	Define atomic radius and packing factor. Obtain packing factor value for SC, BCC and FCC crystals. A crystal plane cuts at 2a, 3b, 6c along the three axes. Determine the Miller indices of the given plane.	12	L_3, L_4	502.1
	b)	i) Derive relation between interplanar distance 'd' and cube edge 'a' in cubic crystal. OR	04	L_5	502.1
	b)	i) A substance with FCC lattice has density 6250 kg/m^3 and molecular weight 60.2. Calculate lattice constant "a". (Avogadro's number = 6.02 x 10^{26} kg/mole.)	04	L_3	502.1
Q.3		**Solve the following questions.**			
	a)	With suitable diagram explain the construction and working of Bragg's X-ray spectrometer. Derive Bragg's law. X-rays of wavelength 1.6Å are diffracted by a Bragg's crystal spectrometer at an angle of 14.2° in the first order. What is the spacing of atomic layer in the crystal?	12	L_1, L_3	502.2
	b)	Explain in brief the concept of reciprocal lattice. OR	04	L_2	502.2
	b)	A powder pattern is obtained for Lead with radiation of λ = 1.54 Å. The (220) reflection is observed at Bragg's angle Θ = 32°. What is the lattice parameter of the Lead.	04	L_3	502.2

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b)	Differentiate between diamagnetic and ferromagnetic materials.	08	L$_4$	502.4

OR

b)	On the basis of Hysteresis loop, distinguish between the soft and hard ferromagnetic materials. A paramagnetic material has a magnetic field intensity of 10^4 A/m. If the susceptibility of the material at room temperature is 3.7×10^{-3}, calculate the magnetization and flux density in the material. (Given $\mu_o = 4\pi \times 10^{-7}$ web/amp.m^2).	08	L$_3$, L$_4$	502.4
c)	The Magnetic filed intensity in a piece of ferric oxide is 10^6 amp/meter. If the susceptibility of the material is 1.5×10^{-3}, Calculate the magnetization of the material and the flux density. (Given $\mu_o = 4\pi \times 10^{-7}$ web/amp.m^2).	04	L$_3$	502.4

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