University of Mumbai

Examination 2020 under cluster 3 (Lead College: FCRIT)

Examinations Commencing from 22rd April 2021 to 30 th April 2021

Program: **FE Sem-I**

Curriculum Scheme: **Rev2019 C Scheme**

Examination: **FE Semester I**

Course Code: **FEC102** and Course Name: **Engineering Physics-I**

Time: 1.5 hour Max. Marks: 60

==========

Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	Find group velocity of an electron whose de Broglie wavelength is 1.2 AU
Option A:	6.07 X 10^8 m/s,
Option B:	6.07 X 10^5 m/s,
Option C:	6.07 X 10^7 m/s,
Option D:	6.07 X 10^6 m/s
2.	Heisenberg's Uncertainty Principle states that the ___ and ___ of an electron cannot be measured simultaneously with great accuracy.
Option A:	Position, Charge
Option B:	Position, Momentum
Option C:	Position, Time
Option D:	Momentum, Energy
3.	A de Broglie wave will be apparent in macroscopic moving particle
Option A:	True
Option B:	False
Option C:	Sometimes True
Option D:	Sometimes False
4.	An electron is confined to a box of dimension 1 AU. Calculate minimum uncertainty in its velocity.
Option A:	1.16 * 10 ^-6 m/s
Option B:	1.16 * 10 ^3 m/s
Option C:	1.16 * 10 ^6 m/s
Option D:	1.16 * 10 ^-3 m/s
5.	Using the wavelength of the X-ray beam that suffers first order Bragg reflection at a glancing angle of 8°35' from a NaCl crystal with lattice spacing 0.282 nm, calculate the maximum order of diffraction possible.
Option A:	6
Option B:	7
Option C:	5
Option D:	8
6.	The ratio of interplanar spacing of (100) : (110): (111) planes of BCC is
Option A:	1:1/√2 :1/√3

Option B:	1:2/√2 :1/√3
Option C:	1:1/√2 :2/√3
Option D:	1:2/√2 :2/√3
7.	Calculate intrinsic carrier density of InSb if its resistivity at room temperature is 2 x 10^-4 Ω-m. If the mobility of electron is 6 m^2/V-sec and mobility of hole is 0.2 m^2/V-sec.
Option A:	5.04 x 10^21/m^3
Option B:	6.04 x 10^21/m^3
Option C:	7.04 x 10^21/m^3
Option D:	4.04 x 10^21/m^3
8.	The layer of positive ions in n type region and layer of negative ions in p type regions is called
Option A:	Barrier Potential
Option B:	Boundary region
Option C:	Junction boundary
Option D:	Depletion region
9.	Match the columns correctly (A) (B) a) Zener Diode i) Unbiased b) LED ii) Reverse Biased c) Photovoltaic cell iii) Forward biased
Option A:	a-ii, b-iii, c-i
Option B:	a-i, b-iii, c-ii
Option C:	a-ii, b-i, c-iii
Option D:	a-i, b-ii, c-iii
10.	When junction is formed between p type material and n type material,
Option A:	The Fermi level of p type material is at higher level than Fermi level of n type material
Option B:	The Fermi level of p type material and Fermi level of n type material lie at the same level
Option C:	The Fermi level of n type material is at higher level than Fermi level of p type material
Option D:	The Fermi level of n type material and p type material will not be at the same level.
11.	Find the minimum thickness of the soap film which will appear yellow (5896 A^0) in reflection when it is exposed by white light at an angle 45°. Take μ=1.33.
Option A:	2.31 x 10^{-6} cm
Option B:	2.31 x 10^{-5} cm
Option C:	1.56 x 10^{-7} cm
Option D:	1.56 x 10^{-5} cm
12.	The diameter of 5th dark ring in Newton's rings experiment was found to be 0.42 cm. Determine the diameter of the 10th dark ring.

Option A:	0.594cm
Option B:	0.694cm
Option C:	0.794cm
Option D:	0.494cm
13.	The minimum thickness of antireflection coating is
Option A:	λ / μ_f
Option B:	$\lambda / 2\mu_f$
Option C:	$\lambda / 4\mu_f$
Option D:	$\lambda / 8\mu_f$
14.	In Newton's ring experiment when liquid is poured between the glass plate and lens the diameter of the rings
Option A:	decreases
Option B:	increases
Option C:	remains unchanged
Option D:	doubles
15.	Superconductor above critical temperature behaves as
Option A:	Bad conductor
Option B:	Normal conductor
Option C:	Superconductor
Option D:	Semiconductor

Q2. **(15 Marks)**	**Solve any three out of four (5 marks each)**
A	Draw the following (030) , (101), (2 1 3) Why is crystal used for X ray diffraction ? State Bragg's law.
B	Newton's rings are formed by light reflected normally from a plano convex lens and a plane glass plate with liquid between them. The diameter of n^{th} ring is 2.18 mm and that of $(n+10)^{th}$ ring is 4.51 mm. Calculate the RI of the liquid, given that the radius of curvature of the lens is 90 cm and wavelength of light is 5893 A°.
C	In a Hall effect setup a n-type Ge sample with donor concentration 2.5 x 10^{21} /m^3 is used. If the magnetic field is 0.5 wb/ m^2, the current density is 500 A/ m^2 and the width of the sample is 4 mm, find the Hall voltage.
D	What is wave group? How does the concept of wave group leads to uncertainty?

Q3. **(15 Marks)**	**Solve any three out of four (5 marks each)**
A	Why do coated lenses appear violet in colour? Interference fringes are produced by monochromatic light falling normally on a wedge shaped film of cellophane whose RI is 1.4. The angle of wedge is 20 seconds of an arc and the distance between successive bright fringes is 0.25 mm. Calculate the wavelength of light.
B	Write the boundary conditions for an electron moving in one dimensional potential box with infinite height walls at x=0 and x=a.

	An electron is bound in an one dimensional potential well of width 2.5 A°, but of infinite height. Find its energy values in the ground state and in first two excited state.
C	Explain Meissner's effect with proper diagram. Show that superconductor is perfectly diamagnetic
D	Explain the position of Fermi level in n type semiconductor. What will happen to Fermi level with increase in temperature and increase in impurity concentration Explain using proper diagram.

University of Mumbai

Examination 2020 under cluster 3 (Lead College: FCRIT)

Examinations Commencing from 22ndApril 2021 to 30th April 2021

Program:FE Sem-I

Curriculum Scheme: Rev2019 – C Scheme

Examination: **FE Semester I**

Course Code: **FEC 102** and Course Name: **Engineering Physics-I**

Time: **2 hour** Max. Marks: 60

==========

2404_R19_FE_I_FEC102_AK1

==========

=

Question Number	Correct Option (Enter either 'A' or 'B' or 'C' or 'D')
Q1.	D
Q2.	B
Q3.	B
Q4	C
Q5	A
Q6	B
Q7	A
Q8.	D
Q9.	A
Q10.	B
Q11.	D
Q12.	A
Q13.	C
Q14.	A
Q15.	B