University of Mumbai

Examinations Summer 2022

Program: First Year Engineering

Curriculum Scheme: Rev. 2019 C Scheme

Examination: FE Semester I

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

Time: 2-hour Max. Marks: 60

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Q1.	**Choose the correct option for following questions. All the Questions are compulsory. (2 Marks each)**
1.	When a ray of light is traveling from a denser medium to rarer medium the refracted ray _____
Option A:	Changes phase by $\pi/2$
Option B:	Changes phase by $\pi/4$
Option C:	Changes phase by $3\pi/2$
Option D:	Does not change phase
2.	The de Broglie wavelength of an electron which has been accelerated from rest through a potential of 64V is
Option A:	3.258 A.U.
Option B:	2.228A.U.
Option C:	1.535 A.U.
Option D:	1.228 A.U.
3.	In which band the Fermi level of n-type semiconductor overlaps if the impurity concentration is increased?
Option A:	Intrinsic fermi level
Option B:	Conduction band
Option C:	Valence band
Option D:	Acceptor level
4.	The minimum thickness of a parallel film, of R.I. μ, illuminated with light for which it appears bright is
Option A:	$\lambda/(2\mu)$
Option B:	$\lambda/(4\mu)$
Option C:	$2\lambda/(4\mu)$
Option D:	$3\lambda/(4\mu)$
5.	The interplanar spacing for a (111) plane in simple cubic crystal whose lattice constant is 4×10^{-8} cm is
Option A:	1.123 A°
Option B:	2.309 A°
Option C:	1.561 A°
Option D:	1.981 A°
6.	The critical magnetic field for Vanadium is 10^5 A/m at 8.58°K and 2×10^5 A/m at 0°K. Its critical temperature is
Option A:	12.133 K
Option B:	14.133 K
Option C:	13.533 K

Option D:	11.133 K

Q2	**Answer any 4 questions out of 6** **(4 marks each)**
A	A mixture of red light of wavelength 6600A^0 and blue light of wavelength 4400A^0 is incident normally on an air film formed between two glasses plates. The thickness of the air film is 3300A^0. What is the color of light reflected by the air film?
B	A copper strip 1cm wide and 1mm thick is placed in a magnetic field B= 1.5 Wb/m^2. If current of 200A is set up in the strip, calculate Hall voltage that appears across the strip. Given, R_H= 6 x 10^{-7} m^3/C.
C	The spacing between the nuclei of certain crystal is 1.2 A°. At what angle will first order Bragg's reflection occur for thermal neutrons (Given: mass of neutron is 1.67 x 10^{-27} Kg and kinetic energy of neutrons is 0.025eV).
D	Describe the method for determination of wavelength of light using Newton's ring set up.
E	Discuss the effect of variation in temperature on the fermi energy level of n-type semiconductor with the help of labelled diagram.
F	Derive the expression for energy eigen values for free particle in one dimensional potential well.

Q3	**Answer any 4 questions out of 6** **(4 marks each)**
A	What are Miller Indices? Draw the following in a cubic unit cell. i) (1 2 3) ii) ($\bar{1}$ 0 $\bar{2}$) iii) (0 0 $\bar{2}$)
B	Show that the intrinsic fermi level lies in the middle of the band gap.
C	Prove that fringe width is constant in a wedge-shaped thin film set up.
D	Derive the Schrodinger's time independent differential equation for matter waves.
E	Distinguish between Type I and Type II superconductors.
F	What is the probability of an electron being thermally excited to the conduction band in Si at 30°C? The band gap energy is 1.12eV.

Q4	**Answer any 4 questions out of 6** **(4 marks each)**
A	What is De-Broglie's hypothesis? Derive expression for De Broglie's wavelength.
B	Explain the construction and working principle of a Light Emitting Diode.
C	Monochromatic X-rays are incident on a crystal. If first order reflection is observed at a glancing angle of 3.4°, at what angle would the second order reflection is expected?
D	The ground state energy of an electron in an infinite well is 5.6 x10-3 eV. What will be the ground state energy if the width of the well is doubled?
E	What is antireflection coating? What should be the refractive index and minimum thickness of the coating?
F	What is Meissner's effect? Show that a superconductor is a perfect diamagnet.