Register Number:
DATE:

ST. JOSEPH'S COLLEGE (AUTONOMOUS), BENGALURU-27

M.Sc. PHYSICS - III SEMESTER

SEMESTER EXAMINATION: OCTOBER 2021

(Examination conducted in January-March 2022)

PH 9520 – PHYSICS SOFT CORE

Time-1 1/2 hrs. Max Marks-35

This question paper has 2 printed pages

(**The question paper has two parts A& B. Answer any 3 questions from one part and 4 questions from the other part. Each question carries 5 Marks: 5x7=35**)

Part A

1. Explain the thin film synthesis process by CVD and list its important parameters.
2. (a) Name the seven crystal systems and give the relation between the basic lattice parameters.
   (b) Calculate the interplanar spacing for a (321) plane in a simple cubic lattice whose lattice constant is 4.2×10^{-10} m . [3+2]
3. (a) Explain the 2D surface structure determination using RHEED using Ewald's circle.
   (b) In a LEED experiment, for $d=0.2\,\text{nm}$, what is the angular position of the first order diffraction spot using $100\,\text{eV}$ electron spot? [4+1]
4. (a) Explain the tunneling principle for a 1D case with figure used in STM and state the expression for current.
   (b) Explain brightness of an electron source, and effective probe diameter used in SEM? [3+2]
5. (a) What is Raman effect? Give quantum theory of Raman scattering.
   (b) With exciting line $4358\,\text{Å}$ the pure rotation Raman spectrum of a sample gives Stokes line at $4458\,\text{Å}$. Deduce the wavelength of Anti-stokes line. [3+2]

Part B

(Please keep your sentences to a maximum of five for each sub-question)

6.
   (a) What is Olbers' Paradox? How is the paradox resolved?
   (b) Name the different coordinate systems used to map stars? Explain the details of two such coordinate systems. [2+3]

7.
   (a) What are diffraction limited systems?
   (b) What is the angular resolution of the Hubble Space Telescope that has a diameter of $2.4\,\mathrm{m}$ observing in the green wavelength band centered at $532\,\mathrm{nm}$? [3+2]

8.
   (a) How does the Energy emitted by a point source vary as the distance from the source increases?
   (b) What is the amount of energy absorbed by a square detector having sides equal to $1\,\mathrm{cm}$ that is placed at a distance of $1.5\,\mathrm{m}$ from a $60\,\mathrm{W}$ bulb (assume that $100\,\%$ of the light emitted by the bulb goes out as radiation detectable by the detector)? [2+3]

9.
   (a) Explain how redshifts of astronomical objects are determined.
   (b) A certain galaxy shows that the H-alpha (having a lab wavelength of $6563\,\text{Å}$) is shifted to $6814\,\text{Å}$. What is the redshift of the galaxy? [3+2]

10.
   (a) Write a short note on Normal Distribution.
   (b) Give an example of Normal Distribution. [4+1]