

Seat No.

Tatyasaheb Kore Institute of Engineering and Technology, Warananagar
(An Autonomous Institute, Affiliated to Shivaji University, Kolhapur)

F.Y.B.Tech.(All Branches) (Sem-I)

End Semester Examination, December-2023

Course Name :	Engineering Physics	Course Code: 23FY101
Day & Date :	Wednesday, 20-Dec-2023	Max Marks 60 Marks
Time :	2:00 pm to 4:00 pm	

- Instructions:**
- All questions are compulsory
 - Figures to the right indicate full marks, Course Outcome (CO) & Bloom's Taxonomy Level (BL) (L1-Remembering, L2- Understanding, L3 – Applying, L4 – Analyzing, L5 – Evaluating, L6 - Creating)
 - Use of a non-programmable calculator is allowed
 - Given: - Electronic charge $e = 1.6 \times 10^{-19}$ C Electron mass $m = 9.1 \times 10^{-31}$ kg
Avogadro's number = 6.025×10^{26} /kg.atom Planck's constant $h = 6.626 \times 10^{-34}$ J.s

	Marks	B.L	CO
Q.1 Attempt any two	12		
a) State and explain Heisenberg's uncertainty principle with the help of the position and momentum of the particle.	6	L2	1
b) Define the atomic radius and packing density. Find the atomic Packing density for the BCC and FCC lattice.	6	L2	2
c) The 4 cm wide plane transmission grating of 10,000 lines per centimeter is used to observe 5000 \AA wavelength. Find the maximum resolving power of the grating for a given wavelength.	6	L2/ L3	5
Q.2 Attempt any two	12		
a) The photon is Compton scattered by an electron through an angle of 90 degrees. Find the energy of the scattered photon and recoiled electron for the incident Photon of energy 10 kilo electron volt.	6	L2/ L3	1
b) Explain the Bragg's X-ray spectrometer with a neat diagram.	6	L2	2
c) Define the resolving power and Derive an expression for the resolving power of plane transmission grating.	6	L2	5
Q.3 Attempt any two	12		
a) Discuss any six applications of nanomaterials.	6	L2	3
b) State and explain factors affecting the acoustics of the auditorium with their remedies.	6	L2	4
c) Define nuclear fusion and explain nuclear fission as a source of energy by using U^{235} .	6	L2	6

Q.4 Attempt any two	12		
a) What are the differences between the principle of STM and AFM? Explain the construction of AFM with a neat diagram.	6	L2	3
b) The volume of room is 600 m^3 . The wall area of the room is 220 m^2 , the floor area is 120 m^2 and the ceiling area is 120 m^2 . The sound absorption coefficient, (a) for the walls is 0.03 Sabine (b) for the ceiling is 0.8 Sabine, and (c) for the floor is 0.06 Sabine. Calculate the average sound absorption coefficient and the reverberation time.	6	L2 /L3	4
c) Explain the terms Spontaneous emission, Stimulated emission and Population inversion with energy level diagram.	6	L2	6
Q.5 Attempt any two	12		
a) Explain the construction and working of Laurent's half-shade Polarimeter.	6	L2	5
b) If the grating has 5000 lines per centimeter and sunlight is used to determine an angular separation of first and second-order spectra of wavelength 7620 \AA .	6	L2/ L3	5
Will the line in the order spectrum be seen?			
c) A reactor is developing nuclear energy at the rate of 50,000 kW. How many atoms of Uranium 235 undergo fission per second? What mass of Uranium 235 in kg would be used in 3,000 hours of operation? Assume that, 200 MeV of energy is released for fission.	6	L2/ L3	6
d) What is thermonuclear reaction? Explain the Carbon-Nitrogen cycle.	6	L2	6

