Roll Number:_______________

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -1 EXAMINATION- 2026

B.Tech-II Semester (BT/BI)

COURSE CODE (CREDITS): 25B11PH212 (04) MAX. MARKS: 15

COURSE NAME: Biophysical Techniques

COURSE INSTRUCTOR: Dr. Ragini Raj Singh MAX. TIME: 1 Hour

Note: *(a) All questions are compulsory.*

(b) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

(c) Use of calculators is allowed

Q.No	Question	CO	Marks
Q1	**(a)** Differentiate between SE1 and SE2, also discuss factors that affects SE emission. **(b)** What is new technology in ESEM? Discuss GSE with the help of diagram.	1	1.5 2
Q2	Explain for TEM: **1.** Image formation basics **2.** Condenser les astigmation and Eucentric position	1	2
Q3	Discuss in full with diagram the Toku Yasu method for the preparation of biological samples for TEM analysis.	1	2.5
Q4	**(a)** If a SEM uses an e- source with brightness B = 10^9 $Am^{-2}sr^{-1}$, beam current for the probe I = 10 nA. Estimate the probe diameter assuming convergence semi angle α = 0.01 rad. **(b)** For a given wavelength λ of and spherical aberration coefficient C_s of lens. Prove that the optimum image aperture α is proportional to $(\lambda/Cs)^{1/4}$. Assume that the net resolution is equal to the summation of theoretical resolution and spherical aberration	2	1.5 1.5
Q5	**(a)** Calculate the theoretical resolution of TEM operative at 250 KV and the given spherical aberration coefficient is C_s=1.0 mm. **(b)** A diffraction ring appears at a radius of 5 mm for TEM with camera length 50 cm and electron wavelength 0.025 Å. Calculate the interplanar spacing. **(c)** The mean free path of electron in a material is 175 nm. Estimate the maximum sample thickness for TEM imaging. Also, define mean free path of electron.	2	1.5 1.5 1

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