BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: MSc **SEMESTER : I[st]**
BRANCH: BIOTECHNOLOGY **SESSION : MO/2025**

SUBJECT: BT401 MOLECULAR CELL BIOLOGY

TIME: 3 Hours **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

			CO	BL
Q.1(a)	Evaluate the molecular architecture of biological membranes and discuss how membrane lipids contribute to membrane integrity.	[5]	1	4
Q.1(b)	Analyze the structural and functional organization of eukaryotic cell organelles.	[5]	1	4
Q.2(a)	Examine the structure–function relationship of nucleic acids and proteins. Discuss how molecular biology tools are used to manipulate DNA, RNA, and proteins.	[5]	1	2
Q.2(b)	Describe the organization of chromatin in eukaryotic cells. Explain the hierarchical levels of DNA packaging with neat, labeled diagram	[5]	2	1
Q.3(a)	Evaluate the principles of cell communication and signal transduction pathways.	[5]	3	5
Q.3(b)	Explain how cell–cell and cell–matrix junctions contribute to tissue integrity. Describe the functional significance of each type of junction in animal and plant systems.	[5]	3	2
Q.4(a)	Define regulated proteolysis and outline its role in cellular homeostasis.	[5]	3	2
Q.4(b)	Illustrate the mechanism of G-protein–coupled receptor (GPCR) signaling. Describe how activation of GPCRs leads to downstream signaling following GPCR activation.	[5]	4	4
Q.5(a)	List and explain the major cell cycle checkpoints (G_1/S, G_2/M, and APC/C checkpoints).	[5]	2	2
Q.5(b)	Describe the key experiments of Weinert and Hartwell (1988) that led to the discovery of cell-cycle checkpoints and CDC genes and explain how temperature-sensitive mutants helped reveal the roles of cyclins and cyclin-dependent kinases (CDKs) in cell cycle progression.	[5]	4	3

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