

MASTER OF BIO-MEDICAL ENGINEERING
FIRST YEAR SECOND SEMESTER EXAM 2025
ADVANCED BIOMATERIALS & TISSUE ENGINEERING

Full Marks: 100

Time: 3h

Answer a total of **100** marks from the following questions

1. Answer any ten from the following questions 10X1=10
 - i. What is liposome?
 - ii. Name one cryoprotectant of cells.
 - iii. Name one organic and inorganic material used in fabrication of drug delivery system.
 - iv. Where do stem cells present?
 - v. What is cell line?
 - vi. What is the earliest polymer based DDS?
 - vii. Name a thermoresponsive polymer.
 - viii. What is the significance of CMC in DDS?
 - ix. Which cell is mother of all cells?
 - x. Normal human adult have _____ different types of mature cells.
 - xi. A normal human adult have approx. _____ of cells.
 - xii. What is the size range of nanoparticle?

2. Answer the questions 10X10=90
 - i. What are the morphological and biochemical characteristics of apoptotic cells? Name the initiator and executioner caspases. Map the initiator caspases with the pathways of apoptosis. Which pathway of apoptosis can be executed in a caspase-independent manner? How extrinsic pathway of apoptosis is executed? (2+2)+(1+1+1)+3
 - ii. Mention the difference between nanoparticles and microparticles. Describe Quantum Dots. Explain how it differs from general nanoparticles. Describe the different process of synthesis of nanomaterials. 3+2+2+3
 - iii. How could you fabricate hydrogels-explain. What is Deborah number? Explain in details swelling phenomena of hydrogels. 6+1.5+2.5
 - iv. Indicate possible mechanisms leads to polymer degradation? How Flory-Rehner equations useful in accessing swelling of hydrogels? 6+4
 - v. Write hydrolytic degradation schemes for different chemical groups. Define Senescence. Describe the Properties of Nanoparticles with proper example. 5+2+3
 - vi. What do you mean by porosity? Define Hayflick limit and how it affects the cell immortalization. In brief along with proper examples explain the biomedical application of Nanomaterials. 2+5+3
 - vii. Write short note on MTT and LDH assay including working principle. 5+5

[Turn over

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- viii. Define tissue engineering. What do you mean by biofilm? How biofilm is involve in development of implant infection? Name the two main causative microorganisms of implant infection. Name the different biocompatibility testing's required as per latest ISO standard. 2+1+2.5+1+3.5
- ix. Illustrate how the growth kinetics is followed during tissue culture environment? How does cooling rate effect cell survival during cryo-preservation? What is the significance of cryo-preservation? 3+3+4
- x. Write a short note on
 - a. Reaction of blood corpuscles to a biomaterial & related tissues. b. hemocompatibility testing. 6+2+2
- xi. Write short note on scaffold. What is confluency? What are the kinds of progeny present in stem cells? What is 'Senescence'? 5+1.5+2+1.5