Ref. No. : Ex/PG/BME/T/127A/2024

MASTER OF BIO-MEDICAL ENGINEERING

FIRST YEAR SECOND SEMESTER EXAM 2024

ADVANCED BIOMATERIALS & TISSUE ENGINEERING

Full Marks: 100 Time: 3h

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

1. A. Answer the following questions 6X1=6
   i. What is the earliest polymer based DDS?
   ii. Name a thermoresponsive polymer.
   iii. What is the significance of CMC in DDS?
   iv. Which cell is mother of all cells?
   v. Normal human adult have _____ different types of mature cells.
   vi. A normal human adult have approx. _____ of cells.

1. B. Match the column C to that of column D 7X1=7

	C		D
i	Earliest DDS	a	Poly (phospoester)s
ii	IL-6	b	Proliferation
iii	First Thermoresponsive gel	c	MTT
iv	Cell viability	d	PVA
v	IL-10	e	Ringsdorf
vi	Synthetic polymer	f	Tanaka
vii	Biodegradable polymer	g	Inflammation

2. Answer the questions 10X9=90
   i. What are the morphological and biochemical characteristics of apoptotic ells? 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 CO2
   ii. With proper example describe green synthesis of Nanoparticles. Describe Quantum Dots. Explain how it differs from general nanoparticles. Describe the different process of synthesis of nanomaterials. 3+2+2+3 CO3
   iii. Classify hydrogel. Write the application of hydrogel. Write the factors affect the swelling of hydrogels as per Flory-Rehner equations. 3+2+5 CO5
   iv. Define hydrogel. Briefly describe the swelling mechanism of hydrogels. What are the different crosslinking methods present for hydrogel preparation? 1.5+2.5+6 CO5

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v. Write the mechanisms leads to polymer degradation? On which factors biodegradability of a polymer depends. 6+4 CO1

vi. Write hydrolytic degradation schemes for different chemical groups. Define Senescence. Describe the Properties of Nanoparticles with proper example. 5+2+3 CO1, CO3

vii. Write short note on hemocompatibility testing. What is the pore diameter range of nanoporous material? What is the drawback of gel electrophoresis in determining apoptosis? How this challenge is addressed in TUNEL assay and writes the basic principle of TUNEL assay? 5+1+1+3 CO4

viii. 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 CO3, CO2

ix. Write short note on MTT and LDH assay including working principle. 5+5 CO4

x. 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 CO1, CO4

xi. 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 CO1

xii. Write a short note on
a. Reaction of body to a biomaterial with special reference to vascular changes.
b. Islet transplantation
c. Name the assays that one can perform to investigate the occurrence of apoptosis.
6+2+2 CO1