

**MASTER OF BIO-MEDICAL ENGINEERING**  
**FIRST YEAR SECOND SEMESTER EXAM 2022**  
**ADVANCED BIOMATERIALS & TISSUE ENGINEERING**

Full Marks: 100

Time: 3h

1. Answer Any **FOUR**

4X1=4

- i. What is the earliest polymer based DDS?
- ii. Calculate the ionic strength of 0.05 M Na<sub>2</sub>SO<sub>4</sub> and 0.02 M NaCl solution.
- iii. What is the significance of CMC in DDS?
- iv. What is Liposome?
- v. Normal human adult have \_\_\_\_\_ different types of mature cells.
- vi. A normal human adult have approx. \_\_\_\_\_ of cells.

## 2. Match the elements of column A to that of column B (Any Six)

6X1=6

	A		B
i	Antimicrobial preservatives	a	Poly (phospoester)s
ii	Antioxidant	b	RGD
iii	Diluent	c	MTT
iv	Surfactant	d	PVA
v	Cell viability	e	Benzyl alcohol
vi	ECM ligand	f	Ascorbic acid
vii	Synthetic polymer	g	Kaolin
viii	Biodegradable polymer	h	Sodium Lauryl Sulfate

3. Answer any **NINE** questions

10X9=90

- i. Differentiate between apoptosis and necrosis? Why is apoptosis important to survival? Give two such examples in real life scenarios. How apoptosis and cancer are related? Given the cells, how can you test it in the laboratory to state whether it's apoptotic?  
3+(2+1)+(3+1)
- ii. What is Nanotechnology? What are the properties of Nanomaterials? What are the different characterization techniques for nanoparticle? Differentiate between Transmission Electron Microscope and Scanning Electron Microscope. Write different Biomedical Application of nanomaterials.  
(1+2)+2+3+2
- iii. Classify hydrogel. Write the application of hydrogel. Write the factors affect the swelling of hydrogels as per Flory-Rehner equations.  
3+2+5
- 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

[ Turn over

- v. Write the mechanisms leads to polymer degradation? On which factors biodegradability of a polymer depends. 6+4
- vi. Write hydrolytic degradation schemes for different chemical groups. Write the sequential events leading to tissue repair or wound healing. Define Senescence. 5+3+2
- vii. Write short note on hemocompatibility testing. Write the main characteristics of a scaffold and name atleast four methods of scaffold fabrication. 5+5
- viii. What do you mean by porosity? What is the pore diameter range of nanoporous material? What is angiogenesis? Define Hayflick limit and how it affects the cell immortalization. 2.5+1+2.5+5
- ix. Write short note on MTT and LDH assay including working principle. 5+5
- 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
- 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
- xii. Write a short note on 6+2.5+1.5
- a. Reaction of body to a biomaterial with special reference to vascular changes.
- b. Islet transplantation
- c. Deborah number