Ref. No.: Ex/PG/BME/T/127A/2018

MASTER OF BIO-MEDICAL ENGINEERING FIRST YEAR SECOND SEMESTER - 2018

ADVANCED BIOMATERIALS & TISSUE ENGINEERING

Time: 3h | Full Marks: 100

1. Answer Any **TEN** 10X2=20
   a. What is Deborah number?
   b. Define Apoptosis
   c. What is the earliest polymer based DDS?
   d. Define porosity.
   e. Calculate the ionic strength of 0.05 M Na_2SO_4 and 0.02 M NaCl solution.
   f. Write the concentration of microflora in stomach and colon.
   g. Define tissue engineering
   h. Name two natural biodegradable polymers.
   i. Write the concentration of microflora in stomach and colon.
   j. Define Hayflick limit.
   k. What is Liposome?
   l. Provide example of the following
      1. Antimicrobial preservatives
      2. Glidant
      3. Antioxidant
      4. Binder

2. Write True(T) or False(F) as applicable (Any five) 5X1=5
   a. Normal human adult have 200 different types of mature cells.
   b. Tissue engineering organs always need external power supply.
   c. Nutrition transport is an important parameter in scaffold fabrication.
   d. A normal human adult have approx. 100 trilion of cells.
   e. Poly (phospoester)s are cheapest among different class of biodegradable polymers present.
   f. Poly (acrylic acid) [Poly electrolyte] are pH sensitive polymers.

3. Answer any **FIVE** questions 5X15=75

   i. Classify hydrogel. Write the application of hydrogel. Why there is a need for colon specific drug delivery system? Write a short note on colon specific DDS.

   3+2+3+7=15

ii. Define hydrogel. Briefly describe swelling mechanism of hydrogels. Write the factors affect the swelling of hydrogels as per Flory-Rehner equations? What are the different crosslinking methods present for hydrogel preparation? 2+2+5+6=15

iii. Write the mechanisms leads to polymer degradation? Write hydrolytic degradation schemes for different chemical groups. On which factors biodegradability of a polymer depend? 6+5+4=15

iv. Give an account on sequential events leading to tissue repair or wound healing. Create a protein (with proper naming of amino acids) from the DNA strand provided below; (through transcription and translation)

A T T A C G A T C T G C A C A A G A T C C T 5+10=15

v. Write a short note on hemocompatibility testing. Name the different biocompatibility testings required as per ISO10993 standard for different conditions. Write the factors on which biocompatibility testing of biomaterials depend. 5+10=15

vi. Write a short note on different cytotoxicity testing. Write a short note on a. Bone marrow transplantation b. Cartilage repair using tissue culture technique.

vii. Name different methods present for scaffold fabrication. 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? 5+3+3+4=15