B.TECH/BT/8TH SEM/BIOT 4242/2019

TISSUE ENGINEERING (BIOT 4242)

Time Allotted : 3 hrs

Full Marks : 70

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and <u>any 5 (five)</u> from Group B to E, taking <u>at least one</u> from each group.

Candidates are required to give answer in their own words as far as practicable.

Group – A (Multiple Choice Type Questions)

- 1. Choose the correct alternative for the following: $10 \times 1 = 10$
 - (i) Popular type of bioreactor in use in tissue engineering is

 (a) CSTR
 (b) plug flow reactor
 (c) bubble column reactor
 (d) perfusion reactor.
 - (ii) Which of the following is not a characteristic property of ceramic material?
 (a) High temperature stability
 (b) High mechanical strength
 (c) Low elongation
 (d) Low hardness.
 - (iii) Hydrogel can also be used as scaffolds for
 (a) cell growth
 (b) cell delivery
 (c) cell growth and delivery
 (d) none of these.
 - (iv) Which of the following statements is true?
 - (a) Embryonic stem cells are totipotent, meaning they are able to from all tissues including germ cells.
 - (b) Pluripotent embryonic stem cells do not exist in the human body.
 - (c) Mesenchymal stem cells are pluripotent; they can't form extraembryonic layers.
 - (d) Multipotency means the ability to form multiple tissues from all three germ layers.
 - (v) Polymeric biomaterial is generally sterilized by
 (a) dry heat sterilization
 (b) moist heat sterilization
 (c) gas sterilization
 (d) gamma sterilization.
 - (vi) The outer layer of the epithelium hardens due to deposition of a waterproof protein called(a) actin(b) keratin

(d) adipose.

(u) ucun		
(c) melanin		

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- (vii) What are the main type of cells in cartilage?
 (a) Chondrocytes
 (b) Fibroblasts
 (c) Osteoblasts
 (d) Osteocytes.
- (viii) Which one of the following is not related to rapid prototyping definition?
 (a) Layer by layer
 (b) Physical model
 (c) From 3D CAD data
 (d) Production line.
- (ix) What type of cell is a desired cell developmental outcome and would be most able to promote bone tissue formation?
 (a) Osteoclasts
 (b) White blood cells
 (c) Osteoblasts
 (d) Fibroblasts.
- (x) Which of the following are potential therapeutic uses of embryonic stem cells?
 - (a) Repair damage to heart muscle after a heart attack
 - (b) Regenerate cells of the immune system
 - (c) Replace neurons after an accident
 - (d) All of the above are potential therapeutic uses of embryonic stem cells.

Group – B

- 2. (a) How does different types of cellular receptors shows cell signalling in response to the signal?
 - (b) How is rector tyrosine kinase signalling pathway involved in angiogenesis?
 - (c) How does integrin mediated signalling help in cell proliferation?

4 + 4 + 4 = 12

- 3. (a) What is angiogenesis? Describe the mechanism of developmental angiogenesis.
 - (b) Differentiate between vasculogenesis and angiogenesis.
 - (c) Classify growth factors based on their principal sources and primary activity.

(1+3)+4+4=12

Group – C

4. (a) Describe the role of alginate in wound healing and cartilage repair? How can we promote cell adhesion property on scaffolds?

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- (b) Describe the properties of two synthetic biodegradable polymers.
- (c) What is bioceramics? Give example and their use in TE.

(2+2) + (2.5+2.5) + 3 = 12

- 5. (a) Describe three important techniques of scaffold fabrication.
 - (b) What are the different motif that play important role in cell-ECM interaction?
 - (c) How can elective Laser Sintering be used for scaffold designing?

6 + 4 + 2 = 12

Group – D

- 6. (a) Explain the role of matrix in cell culture. Give the detail about matrix material that are generally used.
 - (b) What is the principle of cryopreservation of animal cell?
 - (c) What are the special conditions are used to grow animal cell?

$$(2+2)+4+4=12$$

- 7. (a) What are the different types of stem cells present according to their source?
 - (b) Which type of stem cells are used in TE and why?
 - (c) What is 3-D culture? How does 3-D culture help in TE?

4 + 4 + (1 + 3) = 12

Group – E

- 8. (a) What are the different controlled release strategies used in tissue engineering?
 - (b) Explain three important ethical issues in tissue engineering.
 - (c) What are the different polymers that can be used in bone tissue regeneration?

7 + 3 + 2 = 12

- 9. (a) How does cartilage tissue engineering help in osteoarthritis treatment?
 - (b) What are the treatments available for central nervous system injury and peripheral nervous system injury?
 - (c) What is bioartificial pancreas?

4 + 6 + 2 = 12

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