Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

II SEMESTER M.Tech (BME) DEGREE END-SEM EXAMINATIONS APRIL/MAY 2017
SUBJECT: TISSUE ENGINEERING (BME 5239)
(REVISED CREDIT SYSTEM)

Saturday, 29th April 2017: 9 AM to 12 Noon

TIME: 3 HOURS **MAX. MARKS: 100**

Instructions to Candidates:

1. **Answer all the five full questions.**
2. **Answer should be brief and to the point**

1.	(a)	You are asked to make a porous CHITOSAN scaffold. How would you proceed to make the interconnected porous scaffold?	(5)
	(b)	Explain the functions of the following components in formulating a culture medium: (i) Sodium chloride, (ii) sodium bicarbonate, (iii) phenol red, (iv) antibiotics, (v) serum.	(10)
	(c)	Highlight the stages involved in "Autologous Chondrocyte Transplantation" process.	(5)
2.	(a)	Explain the basic components of connective tissues.	(6)
	(b)	Compare the principles involved in moist heat sterilization and ETO sterilization.	(4)
	(c)	Explain the strategies you would adopt to sterilizing the following items: (i) Heat sensitive soluble culture medium, (ii) reagents and air inside cell culture room, (iii) gelatin scaffold, and (iv) A "portion of exposed arm" for vaccination.	(10)
3.	(a)	Highlight the role of ectoderm and mesoderm in the development of epidermis, dermis and subcutaneous layers of skin.	(8)
	(b)	How does "catenin" regulate hard tissue differentiation (bone/chondrocyte)? Explain.	(4)
	(c)	Correlate the interdependence of the following cells in the signaling in bone: (i) Osteocyte, (ii) lining cell, (iii) osteoblast, and (iv) osteoclast.	(8)

4. (a) Explain the role of each component in ligand driven cell signaling process (in the context of keratinocyte proliferation). (6)

(b) Explain the signaling pathways involved in the differentiation of mouse embryonic stem cells. (4+2)
How would you maintain self-renewal using the same parameters involved in the signaling pathways?

(c) Explain the different types of stem cell niche. (6+2)
How would stem cell niche respond to extrinsic cell signaling?

5. (a) Explain briefly, the stages of isolation of mouse embryonic stem cells. (6)

(b) Compare (i) penetrant and non-penetrant Cryo-protectant, (ii) rate zonal and isopycnic gradient centrifugation methods (6)

(c) (i) Overexpression of VEGF can cause vascular damages in diabetic retinopathy and cancer. Justify the statement and suggest remedial measures. (4x2)
(ii) In the superficial and transzonal region of an articular cartilage, collagen fibers are horizontally oriented. Indicate the significance of such orientation.
(iii) What would be your strategy to select specifically chondrocyte cells from a mixed population of cells containing hepatocytes along with neural cells?
(iv) What would happen if you use membrane filter of pore size 0.01 μm alone to remove all microorganisms including viruses, instead of stepwise removal using membrane filters of pore size 0.2 μm and 0.01μm?