Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

(A Constituent Institute of -Manipal University)
Manipal – 576 104

II SEMESTER M.Tech.(BME) DEGREE END SEMESTER EXAMINATIONS, MAY 2016
SUBJECT: TISSUE ENGINEERING (BME 534)
(REVISED CREDIT SYSTEM)
Saturday, May 14, 2016: 9a.m. – 12 noon

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

Instructions to Candidates:
1. **Answer any FIVE full questions.**
2. **Answer should be brief and to the point**

1.	(a)	Discuss the different classes of epithelial tissues.	6
	(b)	State the principles associated with the following sterilization methods: (i) Dry heat (ii) moist heat (iii) UV rays (iv) gamma-rays.	10
	(c)	10 spherical crosslinked chitosan-alginate beads were prepared in a laboratory. The beads are transparent and homogeneous. When all these beads were dipped in de-ionized water, the water level rose by 0.6ml (void volume). Calculate the diameter of each bead.	4
2.	(a)	A bioengineer is asked to extract collagen for the fabrication of composite matrix (for designing a segment of bone). (i) Compare the steps involved in the isolation of soluble collagen and insoluble collagen. (ii) After isolation, which one would be suitable for the fabrication of composite matrix? (iii) How are you going to sterilize both the isolated collagen and the matrix?	8
	(b)	What would be your strategy to sterilize the following : (i) gelatin- matrix, (ii) liquid culture media, (iii) glass-wares (iv) exposed wound	10
	(c)	Explain how osmotic pressure can be used for sterilization.	2
3.	(a)	Explain the developmental map associated with the cardio-vascular system.	10
	(b)	Discuss the steps involved in gene activation process.	4
	(c)	Explain the role of SOX -9 and Run X2 in skeletogenesis.	6

4.	(a)	Explain the following stages of cell signaling in skin: (i) Homeostasis and inflammation, (ii) proliferation, (iii) remodeling.	9
	(b)	How would you assess the potency of embryonic stem cells *in vitro* and *in vivo*? How would you assess the onset of differentiation of stem cells using a microscope?	5+2
	(c)	How do G1 phase regulators influence adult stem cell properties?	4
5.	(a)	Explain the working of following selection methods: (i) Rate zonal gradient centrifugation, (ii) antibody panning, (iii) pre-plating, (iv) selective adhesion using fibronectin.	10
	(b)	How would you use collagen to fabricate interconnected porous scaffolds? Write down your strategy in brief and logical manner.	5
	(c)	Highlight the role of the following in cell culture: (i) Feeder cell, (ii) micro-carrier.	5
6.	(a)	Explain the following: (i) Embryonic stem cells can counter 'Hayflick limitation'. (ii) Over expression of VEGF can cause vascular damage in diabetic retinopathy. Justify the statement and suggest remedial measures. (iii) The significance of horizontal orientation on collagen fibers in the superficial and trans zonal region of an articular cartilage. (iv) Trypsin cannot be used to dissociate human embryonic stem cell colonies *in vitro.*	4x3
	(b)	Explain the different steps of harvesting cells.	3
	(c)	Highlight the functions of the components used in culture medium.	5