Q. Code: 309915

Reg. No. | | | | | | | | | | | | | |

B. E / B. TECH.DEGREE EXAM1INATIONS, MAY 2024

Sixth Semester

BT18022- TISSUE ENGINEERING

(Biotechnology)

(Regulation 2018A)

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

CO 1 Gain knowledge and get expertise in the field of tissue engineering.
CO 2 Discuss the basic concepts of tissue engineering.
CO 3 Design and develop reactors for specific tissue engineering application.
CO 4 Apply the knowledge of professional and ethical responsibility in use of stem cells in creating tissue engineered therapies.
CO 5 Design and develop different biomaterial in tissue engineering application.

PART- A(10x2=20Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	Illustrate the concept of homeostasis in highly prolific tissues and its significance.	**1**	**2**
2.	How does angiogenesis contribute to tissue development and repair?	**1**	**4**
3.	Apply the concept of cellular signaling molecules to explain how growth factors influence cell differentiation in tissue engineering.	**2**	**3**
4.	Analyze the advantages and limitations of using synthetic media versus biological media.	**2**	**4**
5.	Outline the process of dedifferentiation in the stem cells.	**3**	**2**
6.	Appraise how the stem cell niche regulates the behavior of stem cells within tissues.	**3**	**4**
7.	How can knowledge of cell-extracellular matrix interactions be applied in the design of biomaterials for tissue engineering?	**4**	**4**
8.	Critically analyze the advantages and limitations of using absorbable biomaterials in TE.	**4**	**4**
9.	Evaluate the role of patents in promoting investment in tissue engineering research and development.	**5**	**4**
10.	Give an account on the ethical considerations associated with commercializing tissue-engineered products?	**5**	**4**

PART- B (5x 14=70Marks)

			Marks	CO	RBT LEVEL
11. (a)	**(i)**	Describe the hierarchical organization of tissues in multicellular organisms, highlighting the structural and functional relationships between cells and extracellular matrix components.	**(7)**	**1**	**2**

	(ii)	Analyze the dynamic states of tissues in response to physiological and pathological stimuli, discussing the mechanisms involved in tissue remodeling, regeneration, and repair.	(7)	1	2
		(OR)			
(b)	(i)	Analyze the process of cell migration in tissue morphogenesis and wound healing, examining the molecular mechanisms and signaling pathways involved in cell motility and directional movement.	(7)	1	2
	(ii)	Explain how do you calculate the persistence time and the gradient based taxis behaviors.	(7)	1	2
12. (a)	(i)	Describe different cell separation methods and discuss the principles, applications, and limitations of each method.	(10)	2	3
	(ii)	How do various agents alter the freezing behavior of cells, and what are the key mechanisms by which these agents facilitate cryopreservation?	(4)	2	3
		(OR)			
(b)	(i)	Discuss the key components, principles of operation, and advantages of bioreactor systems for culturing cells and generating tissue constructs *in vitro*.	(10)	2	3
	(ii)	Discuss the importance of perfusion systems in bioreactors for tissue engineering. What are the benefits of perfusion culture over static culture methods?	(4)	2	3
13. (a)	(i)	Compare and contrast the sources, properties, and potential applications of mesenchymal stem cells and hematopoietic stem cells.	(10)	3	3
	(ii)	Evaluate the role of stem cell therapy in treating degenerative diseases, highlighting key successes and limitations.	(4)	3	3
		(OR)			
(b)	(i)	Provide an overview of induced pluripotent stem cells (iPSCs), including the reprogramming process, factors involved, and potential therapeutic applications.	(10)	3	3
	(ii)	Discuss the advantages and challenges associated with iPSCs compared to other types of stem cells.	(4)	3	3
14. (a)	(i)	Assess the role of biomaterials in tissue engineering, focusing on their	(10)	4	4

interaction with cells and the extracellular matrix.

	(ii)	Provide examples of how different types of biomaterials influence cell behavior and tissue regeneration outcomes.	**(4)**	**4**	**4**

(OR)

(b)	**(i)**	Conduct a comparative analysis of in vitro and in vivo biocompatibility studies for biomaterials used in tissue engineering.	**(10)**	**4**	**4**
	(ii)	Evaluate the reliability of different testing methods and their correlation with clinical outcomes, highlighting key considerations for ensuring safety and efficacy in tissue engineering applications.	**(4)**	**4**	**4**

15. (a)		Examine the case studies of replacement engineering in tissue engineering, specifically addressing the regeneration of organs. Discuss the challenges, successes, and ethical implications of each case study, considering factors such as patient outcomes, long-term functionality, and societal acceptance.	**(14)**	**5**	**4**

(OR)

(b)		Investigate the regulatory, commercialization, and patenting aspects of tissue-engineered products. Analyze the impact of regulatory policies on innovation, market access, and patient affordability. Evaluate the role of patents in promoting investment in tissue engineering research and development.	**(14)**	**5**	**4**

PART- C (1x 10=10Marks)

(Q.No.16 is compulsory)

			Marks	CO	RBT LEVEL
16.		Examine the ethical issues surrounding tissue engineering, including concerns related to patient consent, genetic modification, organ transplantation, and access to advanced therapies. Discuss the role of regulatory frameworks and industry standards in addressing these ethical challenges.	**(10)**	**5**	**5**

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