Question Paper

Exam Date & Time: 06-May-2024 (02:30 PM - 05:30 PM)



MANIPAL ACADEMY OF HIGHER EDUCATION

VI SEMESTER B.TECH END SEMESTER EXAMINATIONS, APRIL/MAY 2024

BIOMATERIALS [BME 4051]

Α

Marks: 50

Duration: 180 mins.

Answer all the questions.

Instructions to Candidates: Answer ALL questions Missing data may be suitably assumed

1)		Sumantra finds a relatively new class of material 'Z' which he wishes to evaluate for clinical application. What parameters he would assess to make the choice clinically viable.	(3)
	A)		
	В)	Shruthi was asked to design composite material from carbon fibre and resin for fracture plates. The modulus of carbon fibre and resin are 200 GPa and 20 GPa respectively. What volume of carbon fibre will be required to make the modulus of the composite plate 100 GPa? Assume that the fibres are aligned in the direction of the test and $V_{resin} + V_{fibres}=1$	(2)
	C)	Classify dental composites based on filler particle size and compare their properties (must highlight limitations of each type and how these limitations are overcome with other type of composites).	(5)
2)		With the help of a neat sketch, compare 'endosteal' and 'subperiosteal' types of dental implants.	(3)
	A)		
	В)	Mrinal was given with two different models of hip implants (THR). The stem of the first one is smooth, and the other one is made rough and porous. Which one do you think would be ideal for hip joint replacement? Justify your answer.	(3)
	C)	Analyse the steps involved for the fixation of dental implant. In this context, explain the significance of assessing bone height, bone density prior to implantation.	(4)
3)	A)	What are the causes of heart valve replacement? Why are patients undergoing mechanical heart valve replacement advised anticoagulant therapy throughout their life? Compare the advantages and disadvantages of mechanical and bioprosthetic heart valves.	(4)
	В)	Santanu has isolated insoluble collagen for the fabrication of a composite matrix to be used for making the stem part of the Total Hip Replacement (THR). Would the orientation of the collagen fibres make any impact on the design of the composite matrix? Analyse your answer.	(3)
	C)	Silicone rubber lenses despite their good oxygen permeability are not being accepted widely as contact lenses. Analyse the problems associated for such poor acceptance.	(3)
4)	A)	Polymethyl methacrylate is a preferred choice for use as bone cement but not for soft contact lens despite its high light transparency (>92%). Comment with proper logic.	(3)
	В)	With a neat sketch mention the different materials constituting knee joint implant.	(3)

C) You have uncoated and hydroxyapatite coated Co-Cr based dental implant. Which one would you (4) prefer to use for improving bone cell density? Justify. 5) Explain how do porogens help in developing porous templates? (2) A) B) 5% of the collagen fibril does not maintain helical form and appear weak. What is the reason for (4) such weak region present in the collagen fibril? Nikita wishes to isolate soluble collagen for the fabrication of a composite matrix. What type of isolation technique would be appropriate? Describe the steps in brief and justify the choice. C) Samir intends to make chitosan based porous scaffold. In this context, propose a strategy that (4) would assist Samir to fabricate the scaffold (Briefly, elaborate the process involved).

-----End-----