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

Question Paper Code : 70329

M.E./M.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2024.

Elective

Computer Aided Design

CD 4091 – BIO MATERIALS

(Common to : M.E. Engineering Design/M.E. Product Design and Development)

(Regulations 2021)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is Wolff's Law and Why is it important to the design of biomaterials for skeletal repair and regeneration?

2. Define Biomaterials and relate it with biocompatibility. What are dental amalgams and state the most commonly used amalgam in India?

3. Differentiate dental implants from dentures.

4. State the surgical procedure of dental implant.

5. What is the composition of bone formation? State its types.

6. What is Stress Shielding effect? State the factors that affect the shielding effect.

7. State the pros and cons of different types of suture materials.

8. What are adhesives? State their medical applications

9. What is blood compatibility? How it is affecting the body response to different materials?

10. What are eye shields? Name few polymers used as eye shields.

PART B — (5 × 13 = 65 marks)

11. (a) Classify the biological materials, biomaterials bio-based materials and biometric materials with suitable applications, When a surgical implantation is performed what are the various ways in which the tissue respond to implants? (13)

Or

(b) What are the different toxicity testing protocols for evaluation of a biomaterial ? Describe one in vitro and in vivo toxicity screening test for biomaterials. (13)

12. (a) What are the primary use of metallic implant materials? Mention the uses of 316 L SS, Co-Cr alloy, Ti and its alloys in orthopedic and dental surgery. (13)

Or

(b) Illustrate briefly the different types of prostheses that comes and maxillofacial replacement and explain the same. (13)

13. (a) Discuss in detail about the materials used for internal fixation devices and joint replacements. (13)

Or

(b) In an injury, patient fractured his tibia and fibula into 4 pieces each in axial direction. Suggest suitable internal fracture fixation device along with installation technique. Give justification. (13)

14. (a) What are the current treatment method for massive skin loss? Analyze the method to construct the best possible perm anent skin replacement (13)

Or

(b) Explain in detail the methodology adopted to choose a best biomaterial in application of skin replacement and explain in detail. (13)

15. (a) What are the characteristics an ideal heart valve should possess? Explain the terms pressure gradient, effective orifice area and regurgitation. (13)

Or

(b) What is artificial heart? Narrate the design requirements of prosthetic cardiac valves. What are the problems associated with different types of valves? (13)

PART C — (1 × 15 = 15 marks)

16. (a) Mention 6 most serious complications associated with heart valve prostheses With suitable illustration explain about the construction working, advantages and hemodynamic assessment of bileaflet valve. (15)

Or

(b) Assume PO2 and PCO2 of blood entering the oxygenator of cardiopulmonary bypass system are 40 mm Hg and 45 m Hg respectively. Suggest the expected values of PO2 and PCO2 of blood entering the patient body. Justify with suitable illustration. (15)

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