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Question Paper Code: UB401

B.E./B.Tech. DEGREE EXAMINATION, NOV 2024

Professional Elective

Biomedical Engineering

21BMV401 BIOMECHANICS

(Regulations 2021)

Duration: Three hours

Maximum: 100 Marks

Answer All Questions

PART A - (10x 2 = 20 Marks)

1. Write notes on Newton's laws of motion. CO1-U
2. Differentiate kinetics and kinematics. CO1-U
3. List the intrinsic properties of biofluid mechanics. CO1-U
4. Difference between Newtonian and Non Newtonian Fluids. CO1-U
5. Write a short note on mechanical properties of articular cartilage. CO1-U
6. Differentiate tendons and ligaments. CO1-U
7. Enumerate the biomaterials used for making implants. CO1-U
8. List out the clinical pathologies served by gait analysis. CO1-U
9. Identify the methods that are generally associated with the finite element analysis. CO1-U
10. List the most common ergonomic injuries in the workplace. CO1-U

PART – B (5 x 16= 80 Marks)

11. (a) i) What is biomechanics? Explain the different forces that acts on the body. CO1-U (10)
ii) Derive the constitutive equations of non-viscous fluid. CO1-U (6)
- Or
- (b) i) Discuss in detail about fundamental concepts of Mechanics in terms of static and dynamic motion. CO1-U (10)
ii) Discuss briefly about the Hookean Elastic solid. CO1-U (6)

12. (a) i) Discuss the dynamics of fluid flow in cardiovascular system. CO1-U (8)
 ii) Justify when the blood will be Newtonian and Non Newtonian. CO3-Ana (8)
- Or
- (b) i) Prove the velocity profile of blood based on their distribution. CO1-U (8)
 ii) Analyze the fluid dynamics of artificial heart valves using a case study. CO3-Ana (8)
13. (a) Analyze the relationship between the viscoelastic properties of hard tissues and their ability to withstand repetitive mechanical stresses over time. CO4-Ana (16)
- Or
- (b) Compare and contrast the biomechanical performance of traditional fixation methods with emerging technologies for different types of bone fractures. CO4-Ana (16)
14. (a) What is free body diagram? Draw a free body diagram of an adult in skate. Describe about the forces acting on the person. CO1-U (16)
- Or
- (b) i) What is Gait analysis? Explain the procedure for gait analysis. CO1-U (8)
 ii) Explain in detail about the lubrication of synovial joints. CO1-U (8)
15. (a) i) Describe the role of Finite element modeling in biomechanics. CO1-U (8)
 ii) Design a computer workstation ergonomically for an adult. CO2-App (8)
- Or
- (b) i) Explain the mechanics involved in injury prevention using ergonomics. CO1-U (8)
 ii) Apply Finite element analysis to the lumbar spine to evaluate the disease and predict future fracture risk. CO2-App (8)