Reg.No.:												

VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN

[AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI]

Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.

Question Paper Code: 120003

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – NOV. / DEC. 2024

Seventh Semester

Biomedical Engineering

U19BMV31 - BIOMECHANICS

(Regulation 2019)

Time: Three Hours Maximum: 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 - Evaluating
	K2 – Understanding	K4 – Analyzing	K6 - Creating

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	Define scalar and vector quantities. Provide an example of each in the context of biomechanics.	2	K1	CO1
2.	State the relationship between velocity, displacement and time.	2	K1	CO1
3.	Identity the factors that alter the rheological properties of blood.	2	K3	CO2
4.	Compare between laminar and turbulent flow of fluid.	2	K2	CO2
5.	Write the formula for the Maxwell model of viscoelasticity.	2	K1	CO3
6.	Differentiate between isometric and isotonic contractions of soft tissues.	2	K2	CO3
7.	Name two examples of immovable joints in the human body. List their functions.	2	K1	CO4
8.	Draw the various articulations of the ankle and foot joint.	2	K1	CO4
9.	What is Finite Element Analysis and why is it important in biomechanics?	2	K2	CO5
10.	List two benefits of maintaining proper ergonomics posture while working at a computer.	2	K1	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.		Questions	Marks	KL	CO
11.	a)	Explain the process of creating a free body diagram for a biomechanical system. Illustrate the step-by-step procedure for analyzing a system in equilibrium with an example.	13	K3	CO1
		(OR)			
	b)	Explain the behavior of Newtonian viscous fluids and how viscosity influences their flow and shear stress. Include examples of how these principles apply to human physiology, such as the dynamics of blood flow.	13	K3	CO1
12.	a)	Draw the structure of a blood vessel and discuss its material properties and the various modeling approaches used to analyze its behavior.	13	K3	CO2
		(OR)			
	b)	Explain the principles of fluid dynamics in relation to prosthetic heart valves. How do these principles affect the design and performance of different types of prosthetic valves, such as mechanical and bioprosthetic valves?	13	K3	CO2
13.	a)	Explain the stress-strain relationship of tendons and ligaments. How is this relationship analyzed in biomechanical modeling, and what insights does it provide into their mechanical behavior and function?	13	K2	CO3
		(OR)			
	b)	Consider a bone fixation device with two screws spaced 50 mm apart used to stabilize a fractured bone with a 10 mm gap under a 500 N load. Identity how the screw spacing and applied load affect stress distribution and the mechanical behavior of the fixation. Discuss factors influencing fixation effectiveness and potential design improvements.	13	K3	CO3
14.	a)	Outline the different types of elbow joint articulations and the movements of the upper extremity by providing detailed explanations and accompanying diagrams.	13	K2	CO4
		(OR)			
	b)	Explain the different types of hip joint articulations and the movements of the lower extremity, with detailed explanations and necessary diagrams.	13	K2	CO4
15.	a)	Describe the use of Finite Element Analysis in spinal biomechanics, including modeling techniques, key objectives, challenges and clinical applications.	13	K3	CO5

(OR)

b)	Explain how ergonomics can help prevent musculoskeletal disorders and outline the key principles for designing work environments that reduce the risk of these conditions.	13	K3	CO5

PART – C

(1 x 15 = 15 Marks)

Q.No.		Questions	Marks	KL	CO
16.	a)	Analyze in detail about the various phases involved in gait cycle along with the temporal reference parameters.	15	K4	CO4
		(OR)			
	b)	Assess the potential health risks of prolonged computer use in a poorly designed workspace.	15	K5	CO5