Seat No.: _____ Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI (NEW) EXAMINATION – WINTER 2018

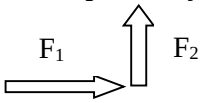
Subject Code:2160308 **Date:30/11/2018**

Subject Name:Biomechanics

Time: 02:30 PM TO 05:00 PM **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

			MARKS
Q.1	**(a)**	State Newton's Laws of Motion.	**03**
	(b)	For F_1 = 40N and F_2 = 30N, where angle with X-axis are $\theta_1 = 0°$ and $\theta_2 = 90°$ respectively. Find Resultant force F. 	**04**
	(c)	Explain different types of force systems.	**07**
Q.2	**(a)**	Explain Free Body Diagram.	**03**
	(b)	Derive Hagen-poiseuille equation for pressure difference ΔP.	**04**
	(c)	Explain Spirometry in detail.	**07**
		OR	
	(c)	Explain mechanism of air flow and respiratory cycle.	**07**
Q.3	**(a)**	Define following terms: (1) Flexion, (2) Abduction, (3) Anterior	**03**
	(b)	List different types of skeletal joints.	**04**
	(c)	For a person doing weight lifting using dumbbell, consider weight of forearm 20N and CG at 15cm from elbow joint, weight of dumbbell is 100N and is held in palm at 45cm. (1) Find moment at elbow for straight hand (vertical) and 90° flexion. (2) At 90° flexion what will be the force applied by biceps on forearm? Assume muscles are joined at 2cm from elbow joint and perpendicular to forearm.	**07**
		OR	
Q.3	**(a)**	Explain composition of bone.	**03**
	(b)	Explain Hinge joint in detail.	**04**
	(c)	For a person wearing weight boot in a seating position and doing lower leg flexion/extension exercise: consider weight of lower leg is 50N and weight of boot is 100N. From knee joint CG at 20cm and weight boot at 50 CM. Find moment at knee joint when lower leg is (1) extended horizontally, (2) at 30° and (3) at 90°.	**07**
Q.4	**(a)**	Explain Laminar Flow.	**03**
	(b)	Compare biological and mechanical Heart valves.	**04**
	(c)	Draw structure and briefly describe characteristics and mechanical property of tendons and ligament.	**07**
		OR	
Q.4	**(a)**	Explain Turbulent Flow.	**03**
	(b)	What are soft and hard tissues? List types of both.	**04**
	(c)	Draw neat diagram of and explain following: (1) Cage and Ball valve and (2) Bi-leaflet valve.	**07**

Q.5	**(a)**	Explain role of biomechanics in design of orthopedic implant.	**03**
	(b)	Explain fixation of implants.	**04**
	(c)	Explain human gait cycle in detail.	**07**

OR

Q.5	**(a)**	Define Biocompatibility and explain its importance.	**03**
	(b)	Explain artificial Hip joint and discuss its specifications.	**04**
	(c)	Explain characteristics of different metals as biomaterial.	**07**

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