Faculty of Engineering, Science and Built Environment

LONDON SOUTH BANK UNIVERSITY

Session 2007/2008 No: 509

Course: BSc (Hons) Sport & Exercise Science

Mode: Full-Time

Level: One

Unit: Biomechanics 1

Date: 03 June 2008

Time: 14:00

Length: Two Hours

Instructions to Candidates

Answer all questions from Section One
Answer two questions from Section Two

Answer the questions in your answer book not on this question paper.

Calculators may be used provided they are noiseless, cordless, not pre-programmed by the candidate and cannot receive or transmit data remotely.

Section One: Definitions and short answers

Answer all eleven questions in Section One

1). Complete the following linear expressions and express the angular equivalents in equation format (including units of measure).

i). $v =$
ii). $a =$

(8)

2). Define the terms kinematics and kinetics. Provide an example of each.

(5)

3). A sprinter of mass 87.6 kg starts from their position in the blocks and after 0.9 seconds has achieved a velocity of 10.21 ms^{-1}. What is the sprinter's acceleration and what force has been applied?

(6)

4).Diagrammatically represent the moment created by muscle on the skeletal system, identifying each component.

(6)

5). Explain the difference between weight and mass. Derive how weight can be classified as a force.

(6)

6). Explain why biomechanists often refer to the velocity of an object as opposed to simply using the speed of an object.

(2)

7). What is meant by the term 'Ground Reaction Force'?

(2)

8). Express the equation that represents a systems 'Moment of Inertia'.

(3)

9). Explain what is meant by the term 'FLUID' in the area of fluid mechanics.

(2)

.....TURN OVER

10). *Figure 1* illustrates an instep kick in soccer. Determine the resultant velocity that will be imparted to the ball at the point of impact, when:
Horizontal velocity = 12 $m.s^{-1}$
Angle of projection = 29°

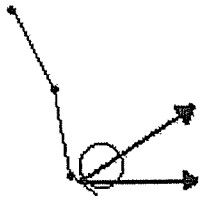

Figure 1 Diagrammatic representation of maximal instep kick

(5)

11). Illustrate and briefly explain the formation of the velocity profile of blood flow in an artery.

(5)

.....TURN OVER FOR SECTION TWO

Section Two: Answer TWO out of three questions. Each question is worth 25 marks.

Question 1

As a biomechanist you are asked to analyse the performance of a standing vertical jump.

i). Identify the important kinematic variables and explain how they may determine performance.

(10)

ii). Identify the important kinetic variables and explain how they may determine performance.

(10)

iii). Explain how both kinetic and kinematic characteristics are linked in this movement.

(5)

Question 2

The 'kinematic sandwich' of gait illustrates the importance of force in relation to human movement. Explain the concept of the kinematic sandwich with particular emphasis on the role of force.

(25)

Question 3

Biomechanics can be broadly defined as "... *The study of the structure and function of biological systems by means of the methods of mechanics.*" (Hatze, 1974).

i). Explain what is meant by this statement specific to the area of sport and exercise biomechanics.

(10)

ii). Outline how sport biomechanics can be used to assess injury / injury potential giving specific sporting examples.

(15)