Faculty of Engineering, Science and Built Environment

LONDON SOUTH BANK UNIVERSITY

Session 2008/2009 No: 513

Course: BSc (Hons) Sport & Exercise Science

Mode: Full-Time

Level: One

Unit: Biomechanics 1

Date: 02 June 2009

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.

Answer **all** questions in the answer book **NOT** on this paper.

Section One: Answer **all** questions.

Section Two: Answer **two** out of three questions.
Each one is worth 25 marks.

Section One: Definitions and short answers

1). From the following (x,y) co-ordinates (in meters) – start (4,4), end (5,17), t = 0.02s – calculate the following:

i]. Component displacements
ii]. Component velocities
iii]. Resultant velocities

(7)

2). Define what the terms vector and scalar mean. Give an example of each.

(4)

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

(2)

4). Explain laminar and turbulent flow. Represent them diagrammatically.

(4)

5). *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 = 7 $m.s^{-1}$
Angle of projection = 29°

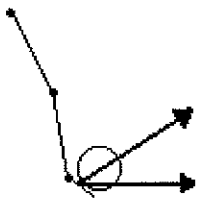

Figure 1 Diagrammatic representation of maximal instep kick

(4)

6). Define 'Moment of Inertia'. Outline this importance of this concept when performing a spin in figure-skating and represent this with a rigid body diagram.

(8)

7). Kinematics and kinetics are two branches of biomechanics. Define kinematics and kinetics and explain how they are integrated in human motion.

(7)

8). What is meant by the term 'Ground Reaction Force' (GRF). Define the orthogonal components of this force.

(4)

9). Define what is meant by the mechanical term 'Moment force' and express this as an equation (defining each varible).

(4)

10). Outline the role of muscle tuning in attenuating the GRF during the impact phase of walking.

(6)

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

Question 1

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.

(5)

II]. Outline how the 'kinematic sandwich' of gait illustrates the importance of force in relation to human movement.

(20)

Question 2

Kicking can be described as a 'sequential action occurring in a proximal to distal fashion'.

I]. Explain what is meant by this description.

(5)

II]. Illustrate and explain a linear velocity–time graph of efficient sequential profiling and inefficient sequential profiling in kicking, explaining each curve relative to kicking performance.

(20)

Question 3

The motion of every segment in the human body can be described in relation to a single point – segmental centre of gravity.

I]. Compare and contrast the segmental method and reaction board method of centre of gravity calculation

(15)

II]. Explain the concepts of segmental centre of gravity and whole body centre of gravity.

(10)