Faculty of Engineering Science and the Built Environment

Department of Applied Science

LONDON SOUTH BANK UNIVERSITY

Session : 2007/8 No: 273

Course No	Course Title Stream	Year Mode
1092	BSc (Hons) Sports Product Design	2
	2FS00	FT
836	BSc (Hons) Sport and Exercise Science	2
	2FS00	FT

Unit : Biomechanics 2

Reference : SSS_2_992

Date : 18 January 2008

Time : 14.00

Time Available : 2 Hours

Instructions to Candidates

Answer questions in the answer book NOT on this question paper.

Section 1: Answer ALL questions.

Section 2: Answer TWO questions

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 questions.

1]. Formulate how the general equation for Newton's 2nd Law is reached from the Impulse-momentum relationship.

(4)

2]. Illustrate and formulate how the Kistler force platform uses moments to calculate point of force application (centre of pressure) when a load is applied to it.

(10)

3]. A long jumper applies a resultant force of 1650 N at take-off with a projection angle of 37° to the horizontal. What are the horizontal and vertical components of this force?

(4)

4]. The 'Moment of Inertia (I)' of a system is critical in human motion. Explain and illustrate the importance of I in relation to walking.

(7)

5]. Explain what is meant by the term muscle tuning relative to Ground Reaction Force (GRF).

(4)

6]. Outline the derivative journey related to linear kinematics and explain the considerations when calculating force based on this 'journey'.

(6)

7]. Explain and illustrate the term orthogonal in relation to GRF.

(4)

8]. Illustrate the mechanical model of muscle.

(4)

9]. Define the terms kinetics and kinematics and provide two examples of each.

(4)

10]. Define the terms concentric, eccentric, isometric contractions.

(3)

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

Question One

a). Describe and explain the characteristics of the Kistler Force Platform used to record forces present in gait and briefly discuss the importance of this data

(15)

b). Calculate the vertical joint reaction forces (RFy) at the ankle (see *Figure* 1) using an inverse dynamics approach from the data provided, briefly discuss the approach and the result.

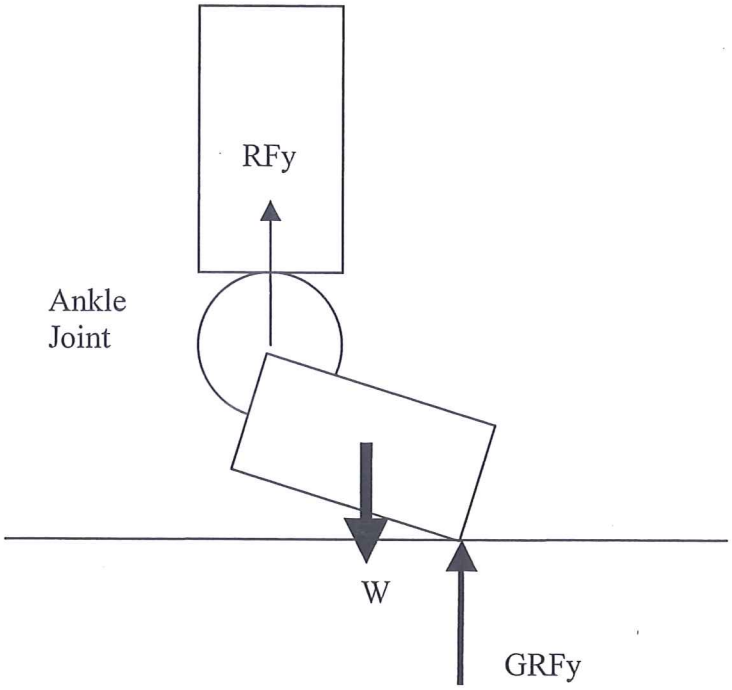

Figure 1 Rigid body representation

Vertical GRF: 1200 N Foot segment mass: 1.5 kg
Segmental Vertical acceleration: 30 $m.s^{-2}$

(10)

Question Two

Design a procedure to analyse the Kinetic and kinematic components of the 'Kinematic Sandwich' relative to human gait.

(25)

.....Turn Over for Question Three

Question Three

a). Illustrate a sequential two-dimensional kinetogram of the lower extremity during a front kick in martial arts. The kinetogram should include anatomical landmarks, definition of angles and a segmental centre of gravity excursion path.

(7.5)

b). Describe in detail how a two-dimensional motion analysis would be performed of this motion.

(12.5)

c). Explain the role of the rectus femoris in the kicking technique.

(5)