BINDURA UNIVERSITY OF SCIENCE EDUCATION

FACULTY OF SCIENCE AND ENGINEERING

DEPARTMENT: SPORTS SCIENCE

MASTER OF SCIENCE DEGREE IN SPORTS SCIENCE

SS 503 BIOMECHANICS FOR HUMAN MOVEMENT

DURATION: 3 HOURS TOTAL MARKS: 100
(Plus 15 Minutes for Practical Preparation/Case Reading)

INSTRUCTIONS TO CANDIDATES

Section A is **compulsory.**

Answer **three** questions from Section B.

Section A

1. High plantar pressures have been shown to be a key risk factor for foot ulceration in people with diabetes. Consequently, patients are often prescribed insoles designed to reduce pressure. New technologies, such as plantar pressure measurement devices and 3D foot scanners, have the potential to improve insole design. However, it is not clear to what extent such technologies are currently being used by clinicians, nor which other factors influence clinical decision making in the prescription of insoles. Furthermore, there has been minimal previous research designed to understand how best to use technology to improve insole design for patients with diabetes.

   What factors influence the orthotic or footwear prescription in relation to your aims and the patient's expectations?" Discuss the advantages and disadvantages of pressure insoles and pressure mats. Also, explain the relative advantages and disadvantages of any three types of pressure transducer. **[40 marks]**

Section B.

2. Addressing potential clients at an exhibition, justify the uses of isokinetic dynamometry in sports biomechanics. **[20 marks]**

3. Explain, briefly, which type of electrode you would think most suitable to: a) record the muscle activity in the pectoralis major of a swimmer; b) record the muscle activity in the vastus intermedius during treadmill running. List the advantages and disadvantages of the three types of EMG electrode suitable for use in sports biomechanics. **[20 marks]**

4. Justify the need for smoothing or filtering of kinematic data, and outline the differences between spline smoothing, digital low-pass filters and Fourier series truncation. Explain why the

measurement of the contact forces on the sports performer is important in sports biomechanics, with reference to examples from research in this area. **[20 marks]**

5. A sprinter uses her calf muscles to push on the blocks at the start of a run.
   a. Explain, using Newton's laws, how this enables her to accelerate forwards out of the blocks. **[10 marks]**
   b. If the resultant forward force was 300 newtons and the runner's mass was 60 kg, what would be her acceleration? **[5 marks]**
   c. What would be the speed of the runner after 1.5 seconds, assuming that the acceleration is the same over that period of time? **[5 marks]**

6. Successful games players are often able to change their velocity rapidly in the game situation. Explain to a group of basketball players, the biomechanics behind this ability using examples from a game of your choice. **[20 marks]**

END OF PAPER