

UNIVERSITY OF FORT HARE

**BIOMECHANICS IN WORK AND
PHYSICAL ACTIVITY (HUS328)**

EXAMINATIONS

November

2025

Time: 3 Hours

Subject: HUS328

Marks: 100



**This paper consists of 4 pages, including the
cover page.**

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Internal Examiners
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External Examiners
Mr Davidson

INSTRUCTIONS

1. Answer all questions
2. It is in the candidate's best interest to write legibly
3. Diagrams should be $\frac{1}{2}$ page or larger
4. Please number your answers.

QUESTION 1**(9)**

Differentiate between kinematics and kinetics using an example of your choice.

QUESTION 2**(15)**

When designing digital human models (DHMs), certain biomechanical indicators are used to create accurate models to analyse specific tasks. Pick any three from the list below and explain why they are used in DHM design separately.

- a) Reach and Fit
- b) Range of Motion
- c) Comfort/Posture
- d) Force Exertion
- e) Joint Moments
- f) Tissue loads

**QUESTION 3****(5)**

Explain the phrase "Muscle Redundancy" and why it is important to maintain equilibrium at a joint.

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QUESTION 4**(5)**

Discuss the problem associated with anthropometrical properties when doing quantitative HFE evaluations during biomechanical assessments.

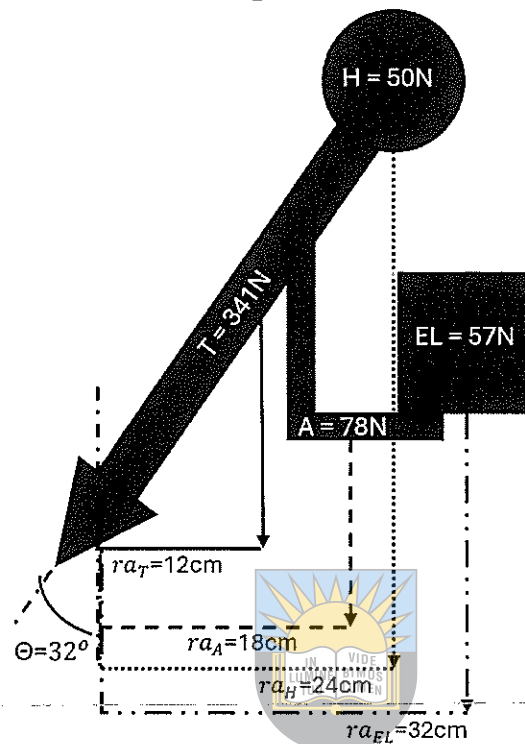
QUESTION 5

Discuss the acute and chronic responses to whole-body vibration.

(15)

QUESTION 6**(19)**

Freddy works as a mechanic in an auto shop, often lifting objects from the floor to a workbench. Using the information and diagram below, answer the following questions.



- What is the total compression force placed on Freddy's L5/S1 at the movement point shown? Assume the insertion point of the erector spinae muscles sits at 6cm from the fulcrum on the posterior side. {13}
- What is the total shear force Freddy experiences? {5}
- If Freddy changed his lifting technique to reduce the amount of back flexion, how would this affect the compression and shear forces his L5/S1 is exposed to? {4}

$$F = ma$$

(4)

QUESTION 7**(32)**

Thandiwe is an office administrator, where one of her tasks is to place folders with a mass of 3.2 kg from a desk to a shelf at head height. Using this information and your knowledge from the course, answer the following questions.

a) Calculate the force generation the deltoids need to lift the box if the distance {6}
between Thandiwe's shoulder and hand is 70cm and the deltoid insertion point
is 6cm.

b) Does this movement indicate mechanical advantage or disadvantage? Explain {8}
your answer, touching on why this type of lever is useful for human movement.

c) If Thandiwe bends her arm and the lever length decreases to 50cm, what would {5}
the new force requirement of the deltoid be? Explain why the change in lever
length would result in this change.



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d) Thandiwe has started to notice discomfort and numbness in her shoulders. {10}
Explain the factors associated with the mechanical aetiology of nerve-related
MSDs and why Thandiwe may be experiencing these symptoms

[END]

[100]