University of Fort Hare
Together in Excellence

HUS-323

DEGREE EXAMINATIONS
NOVEMBER 2018

TIME: 3 HRS

SUBJECT: HUMAN MOVEMENT SCIENCE

MARKS: 100

PAPER: BIOMECHANICS

INTERNAL EXAMINERS	EXTERNAL EXAMINER
Mr. Xoxo; Mr. Mandiringana	Prof. Travill

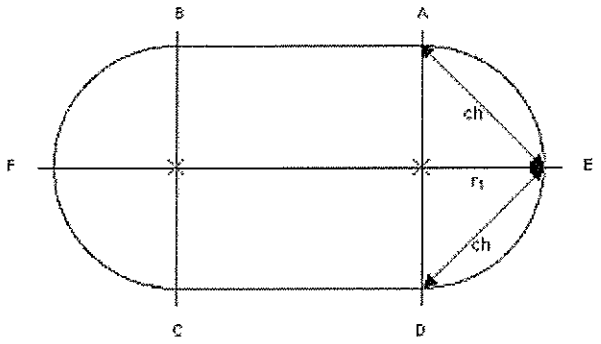
INSTRUCTIONS:
Answer All Questions

Question 1 **[36]**

a. Name and explain two forces that act on and change the motion of a soccer ball kicked into the air (and thus becomes a projectile). (2 × 2 = 4)

b. Discuss the three different optimum angles of release or take-off bearing in mind the purpose of the activity. (2 × 3 = 6)

c. The sketch below represents an athletics track. One lap is exactly 400 m.



i. Derive a formula for the total length of the track (t) in terms of s, π and r. (3)

ii. Make r the subject of the formula and hence find the find the radius of the semi-circular portions if the straight length from A to B is 90 m, one lap 400 m and π ≈ 22/7. (5)

iii. If a lane 0.7 m wide is marked outside the given track, how far ahead should the outer runner start if he too is to complete 400 m at the line through F? (5)

d. A cross-country skier travels 5Km due North, makes a right-angled turn, and travels a further 12Km due East. (a) If the distance is covered in 51 min, what is the skier average speed in Km/h? (b) What is the magnitude of the skier's average velocity in Km/h? (8)

e. A softball player sprints from first base to second base. If her instantaneous horizontal velocity is 9.3 m/s when she is 8 m from second base and 7.5 m/s when she is 5 m from second base 0.4 s later, what is her average acceleration over that 3 m interval? (Assume that she travels in the positive direction when moving from first to second.) (5)

Question 2 **[18]**

a. Contrast two volleyball players in terms of their velocity of the hand, 'A' with longer arms and 'B' with shorter arms using the following statement to prove your case: The velocity of the hand is equal to the product of the angular velocity of the arm and the distance from the hand to the axis of rotation. (10)

b. A tennis ball travelling at 25m/s meets a racket travelling in the opposite direction at 35m/s and then after impact, the racket and ball travel in the same direction with velocities of 10m/s and 30m/s, respectively. If the direction in

which the ball was moving before impact is arbitrarily designated as positive, calculate the coefficient of restitution. (8)

Question 3 **[46]**

a. Explain the different types of levers by means of examples. (2 × 3 = 6)

b. Discuss the various types of stability, giving examples of each. (4 × 3 = 12)

c. Explain the lift and drag on a javelin in flight by means of a sketch. (9)

d. Explain the concept of density and explain why certain members of the community will float easier than others. (6)

e. Discuss the Magnus effect by explaining how lift forces are generated by spinning balls. (7)

f. Explain Newton's laws of motion and their application in sports. (6)

TOTAL 100