Question Paper

Exam Date & Time: 18-Jun-2024 (10:00 AM - 01:00 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

THIRD SEMESTER B.Sc.EXERCISE AND SPORTS SCIENCES DEGREE EXAMINATION-JUNE 2024
SUBJECT: ESS2101- SPORTS BIOMECHANICS
(2020 SCHEME)

Marks: 100 **Duration: 180 mins.**

Answer all the questions.

1)	Calculate the hip, knee, and ankle angle of the rear leg of a Sprinter at the starting block, based on the following coordinates: Lateral trunk (10, 4), Greater Trochanter (9.52, 3.44), Lateral Knee (9.96, 2.10), and Lateral Malleolus (8, 1), and fifth metatarsal (1, 0.2). Please mention all the segmental angle relative to the right horizontal and justify the relative angles. (5+5+5+5 = 20 marks)	(20)
2)	a) Define Drag Force. Describe the factors affecting drag force with an example in sport (1+5+4 = 10 marks) b) Define Magnus effect. Explain in detail the types of swing of a cricket ball with suitable diagram (2+8 = 10 marks)	(20)
3)	Describe the phases of gait. Explain the kinetics of gait in sagittal plane with suitable diagram. (5+5 = 10 marks)	(10)
4)	Identify three practical examples of each of Newton's laws of motion, and clearly explain how each example illustrates the law.	(10)
5A)	Describe the optimal posture with a suitable diagram.	(5)
5B)	Explain the Hill Muscle model with a suitable diagram.	(5)
5C)	In a cricket match, a bowler delivers a cricket ball with a mass of 1 kg, and it reaches the wicketkeeper's gloves traveling at a velocity of 28 m/s. i) Calculate the momentum of the cricket ball as it reaches the wicketkeeper's gloves. Provide the formula used for this calculation and the units of momentum. ii) Determine the impulse required to bring the cricket ball to a complete stop once it reaches the wicketkeeper's gloves. iii) If the cricket ball is in contact with the wicketkeeper's gloves for 0.5 seconds during the catch, calculate the average force applied by the gloves to stop the ball. (1+2+2 = 5 marks)	(5)
5D)	Describe the length-tension relationship with a suitable diagram.	(5)
5E)	Describe the Relationship between Angular and Linear Kinematics.	(5)
5F)	Explain the factors affecting projectile motion with an example.	(5)
6A)	Define Torque.	(2)
6B)	Define kyphosis.	(2)
6C)	Explain force couple with an example.	(2)
6D)	Define and briefly explain the concept of rearfoot angle in angular kinematics.	(2)
6E)	Define radius of gyration.	(2)

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