INFORMATION AND COMMUNICATIONS UNIVERSITY

ADVANCED PHYSICS

JUNE 2020 MAKE UP EXAMINATION

Time Allowed: **3 Hours**

INSTRUCTIONS

1. **Answer ONE COMPULSORY Question in Section A**
2. **Answer any FOUR (4) Questions in Section B**.
3. **ALL Questions carry (20marks)**
4. Please write as clearly as possible as illegible handwriting cannot be marked.
5. Number the answers to the questions clearly before answering
6. Illustrate your answers were possible.

Section A. Compulsory Question

1. A satellite is in a circular orbit around the planet Saturn. Derive the relationship between the period of the satellite , the mass of Saturn and the radius of orbit
   (10)

Section B: Choose **ANY** four (4) questions from this section.

2.

a. Use dimensional analysis to show the correct dimensions for quantities below.
   (8)

QUANTITY	DIMENSION
FORCE	
POWER	
PRESSURE	
WORK, ENERGY	

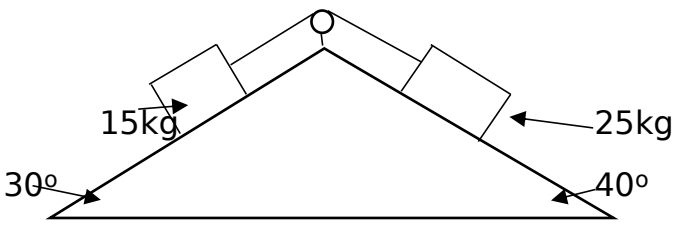
b. Prove that the equation F=ma is dimensionally correct
   (2)

3. A ball is projected vertically upwards with an initial velocity of 30m/s. Neglecting air resistance and taking g to be 10m/s^2.
   a. Find its maximum height
      (2)
   b. The time taken to return to its starting point.
      (3)
   c. Plot a velocity-time graph for its downward motion
      (4)
   d. Predict what would happen to the time of flight if :

i. The initial velocity is reduced ii. The mass of the ball is reduced (neglecting air resistance)
   (2)

4.

a) Consider the system below



Find:

i. The acceleration. (2marks)
ii. The velocity in 5s (2marks)
iii. The displacement in 5s (2marks)
iv. The tension in the cable.(2marks)

v. The friction force (2marks)
vi. The force required to overcome friction. (2marks)
Note: Both the object and the surface are made of wood and the coefficient of kinetic friction is 0.3.

5. A frustrated man weighing 60kg climbs a network tower 50m high and suddenly loses his footing and falls to the ground.

a) Determine his GPE at the top of the tower
(2)

b) The kinetic energy just before he hits the ground
(2)

c) Determine the velocity with which he hits the ground
(2)

d) How long does he take to reach the ground?
(2)

e) Explain why the kinetic energy and the potential energy half way through the flight are equal
(2)