

**MERU UNIVERSITY OF SCIENCE AND TECHNOLOGY**

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**University Examinations 2016/2017**

FIRST YEAR, FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE MATHEMATICS AND COMPUTER SCIENCE AND BACHELOR OF COMPUTER SCIENCE AND FORENSICS

**SPS 3111: GENERAL PHYSICS**

**DATE: December, 2016 TIME: HOURS**



**INSTRUCTIONS:** *Answer questions* ***one*** *and any other* ***two*** *questions.*

*Use the following constants where necessary*

*g = 9.8, e = 1.6 x C, K = 9.0 x*

**QUESTION ONE - (30 MARKS)**

1. State the meaning of the following terms giving an example for each of them;(4 Marks)
2. Fundamental Quantities
3. Derived Quantities
4. Dimensions
5. System of units
6. State the three Newtron laws of motion giving the mathematical equation for each. (6 Marks)
7. State the Coulomb laws of electrostatics. (3 Marks)
8. State the superposition principle. Hence show the distribution of forces for three negatively charged particles arranged on a straight line within the proximity of each other. (4 Marks)
9. Using an appropriate circuit and I/t sketch graphs, explain what is meant by ac rectification. (4 Marks)
10. State the two Kirchoff’s laws and give the mathematical equation for each of them. (4 Marks)
11. What is filtering? Sketch a simple filtering circuit. (3 Marks)
12. State the Faradays and Lenz laws of electromagnetic induction. (2 Marks)

**QUESTION TWO (20 MARKS)**

1. An entertainer juggles balls while doing other activities. In one act, she throws a ball vertically upward, and while it is in the air, she runs to and from a table 5.50m away at a constant speed of returning just in time to catch the falling ball.
2. With what minimum initial speed must she throw the ball upward to accomplish this feat? (5 Marks)
3. How high above its initial position is the ball just as she reaches the table?

(5 Marks)

1. A hockey puck with mass 0.160kg is at rest at the origin on the horizontal, frictionless surface of the rink. At time a player applies a force of 0.250N to the puck, parallel to the x – axis; he continues to apply this force until.
2. What are the position and speed of the puck at (5 Marks)
3. If the same force is again applied at what are the position and speed of the puck at (5 Marks)

**QUESTION THREE (20 MARKS)**

1. In the circuit shown below, find (12 Marks)
2. The current in resistor R
3. The resistance R;
4. The unknown emf
5. If the circuit is broken at point x, what is the current in resistor R?
6. A particle with charge travels in a circular orbit with radius 4.68mm due to the force exerted on it by a magnetic field with magnitude 1.65T and perpendicular to the orbit. (8 Marks)
7. What is the magnitude of the linear momentum of the particle?
8. What is the magnitude of the angular momentum of the particle?

**QUESTION FOUR (20 MARKS)**

1. Two point charges are placed on the –axis as follows: Charge is located at and charge is at What are the magnitude and direction of the total force exerted by these two charges on a negative point charge that is placed at the origin? (12 Marks)
2. (i) What must the charge (sign and magnitude) of a 4.5g particle be for it to remain stationary when placed in a downward-directed electric field of magnitude 0.045 N?

(4 Marks)

(ii) What is the magnitude of an electric field in which the electric force on a proton is equal in magnitude to its weight? (4 Marks)

**QUESTION FIVE (20 MARKS)**

1. The figure below shows a system of four capacitors, where the potential difference across is 50.0V. (12 Marks)
2. Find the equivalent capacitance of this system between a and b.
3. How much charge is stored by this combination of capacitors?
4. How much charge is stored in each of the 10 and the 9 capacitors?
5. An idealized voltmeter is connected across the terminals of a 15.0-V battery, and a 75.0𝛺 appliance is also connected across its terminals. If the voltmeter reads 11.3. (8 Marks)
6. How much power is being dissipated by the appliance and
7. What is the internal resistance of the battery?