

Instructions to candidates

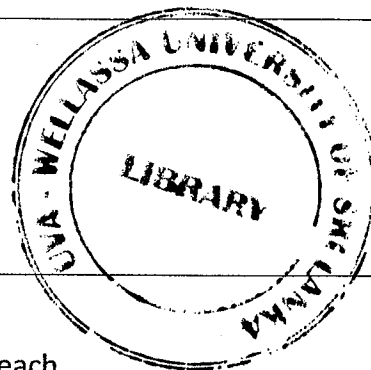
Duration: 01 hour

Number of questions: 02

Number of questions to be answered: 02

Mark allocation: 100

All symbols carry their usual meaning.



- 1.
- a. What are vectors and scalars? Give 3 examples for each.
(10 marks)
- b. If $\vec{a}$ and $\vec{b}$ are two vectors, write their scalar and vector products.
(10 marks)
- c. Show that although the scalar product of two vectors obeys commutative law, their vector product does not.
(10 marks)
- d. For the vectors, $\vec{a} = (3.0m)i + (4.0m)j$ and $\vec{b} = (5.0m)i + (-2.0m)j$,
Find $\vec{a} + \vec{b}$
- i. in unit-vector notation
- ii. as a magnitude and
- iii. as an angle (relative to i).
(10marks)
- e. Now find $\vec{b} - \vec{a}$
- i. in unit-vector notation
- ii. as a magnitude
- iii. as an angle (relative to i)
(10 marks)

2.

- a. Write Newton's laws of linear motion.

(10 marks)

- b. An electron with a speed of 1.2×10^7 m/s moves horizontally into a region where constant vertical force of 4.5×10^{-16} N acts on it. The mass of the electron is 9.11×10^{-31} kg.

- i. Show this information in a diagram

(10 marks)

- ii. Calculate the vertical distance the electron is deflected during the time it has moved 30 mm horizontally.

(10 marks)

- c. What is Newton's law of gravitation?

(10 marks)

- d. A physics student whose body mass is 50 kg is listening to a lecture while sitting on a chair next to her friend, whose body mass is 47 kg. The two chairs are lying next to each other and are separated by 10 cm away from each other. Given the gravitational constant is 6.67×10^{-11} N.m²/kg². Calculate the gravitational force acting between the two students.

(10 marks)