Candidate's Index Number
Signature:

UNIVERSITY OF CAPE COAST
COLLEGE OF EDUCATION STUDIES
SCHOOL OF EDUCATIONAL DEVELOPMENT AND OUTREACH
INSTITUTE OF EDUCATION

COLLEGES OF EDUCATION
FOUR-YEAR BACHELOR OF EDUCATION (B.ED)
FOURTH YEAR, SECOND SEMESTER MID-SEMESTER QUIZ, OCTOBER 2023

27TH OCTOBER 2023   VECTORS AND MECHANICS   12:00 PM – 12:30 PM

Answer ALL the questions.
[20 MARKS]

For items 1 to 10, each stem is followed by four options lettered A to D. Read each item carefully and circle the letter of the correct or best option.

1. A unit vector has the magnitude of ....
   A. 0
   B. 1
   C. 5
   D. 10

2. The splitting of a vector into two component vectors is called vector ....
   A. decomposition.
   B. difference.
   C. resolution.
   D. sum.

3. Find the vector sum of $\overrightarrow{AC} + \overrightarrow{CL} - \overrightarrow{ML}$.
   A. $\overrightarrow{AC}$
   B. $\overrightarrow{AL}$
   C. $\overrightarrow{AM}$
   D. $\overrightarrow{ML}$

4. What is the standard **form** for the resolution of a vector having magnitude $|\vec{r}|$ and is inclined at an angle θ to the x-axis?
   A. $|\vec{r}|(\cos\theta\,\hat{\imath} + \cos\theta\,\hat{\jmath})$
   B. $|\vec{r}|(\cos\theta\,\hat{\imath} + \sin\theta\,\hat{\jmath})$
   C. $|\vec{r}|(\sin\theta\,\hat{\imath} + \cos\theta\,\hat{\jmath})$
   D. $|\vec{r}|(\sin\theta\,\hat{\imath} + \sin\theta\,\hat{\jmath})$

5. If $\overrightarrow{AB} = -2i + 3j + k$, then $|\overrightarrow{AB}|$ is ....

    A. $\sqrt{2}$

    B. $\sqrt{6}$

    C. $\sqrt{13}$

    D. $\sqrt{14}$

6. What happens when a vector is multiplied by a scalar? Its ....

    A. direction rotates in XY plane by that much angle.

    B. direction rotates in YZ plane by that much angle.

    C. direction rotates in ZX plane by that much angle.

    D. magnitude gets multiplied by that much amount.

7. Vector $\vec{v}$ has a magnitude of 6 units and it creates an angle of $210°$ with the positive x-axis. Find the magnitude of $\overrightarrow{-4v}$ and direction it *makes* with the positive x-axis.

    A. Magnitude = 24,   direction = 210^0

    B. Magnitude = 24,   direction = 30^0

    C. Magnitude = -24, direction = 30^0

    D. Magnitude = -24, direction = 390^0

8. Vector $\vec{v}$ starts at the origin and ends at point B in the drawing below. Assuming $\overrightarrow{2v}$ starts at the origin, which option could be its endpoint? Circle the correct point on the diagram.
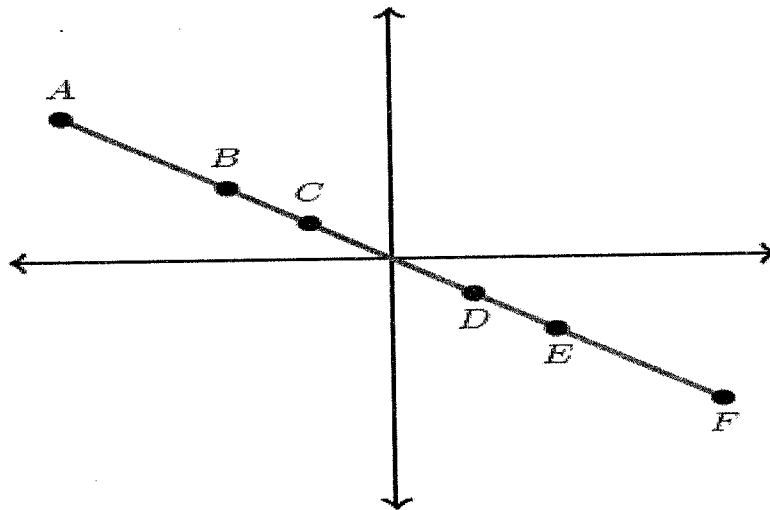
9. What is the resolved form for a vector which is 5 units long and is inclined at an angle of 45 degrees to the positive x-axis?

    A. $\frac{1}{\sqrt{2}}i + \frac{1}{\sqrt{2}}j$

    B. $\frac{10}{\sqrt{2}}i + \frac{10}{\sqrt{2}}j$

    C. $\frac{5}{\sqrt{2}}i + \frac{15}{\sqrt{2}}j$

    D. $\frac{5}{\sqrt{2}}i + \frac{5}{\sqrt{2}}j$

10. If $\theta = 0°$, then $|a \times b| = $ ....
    A. 0
    B. 1
    C. ab
    D. -ab

For items 11 and 12, write the appropriate responses in the spaces provided.

11. If $\overrightarrow{AO} + \overrightarrow{OB} = \overrightarrow{BO} + \overrightarrow{OC}$, then prove that B is the midpoint of $\overrightarrow{AC}$.   **[4 marks]**

12. Kwame and Yaro set out from school simultaneously. Kwame goes due north, and Yaro runs on a bearing of 047^0. When Yaro has gone 550m, the boys are 500m apart. How far is Kwame from the school?   **[6 marks]**