

OCTOBER 2023
EMA 321SW
DEVELOPING PEDAGOGICAL CONTENT
KNOWLEDGE IN VECTORS AND MECHANICS
1 HOUR 20 MINUTES

Candidate's Index Number
1E/MAI/SJ/20/0076
Signature:

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

FIVE-SEMESTER BACHELOR OF EDUCATION (SANDWICH) PROGRAMME
LEVEL 350, END-OF-SECOND SEMESTER EXAMINATION, OCTOBER 2023

5TH OCTOBER 2023

DEVELOPING PEDAGOGICAL CONTENT
KNOWLEDGE IN VECTORS AND MECHANICS

2:40 PM - 4:00 PM

SECTION B
[60 MARKS]

Answer any TWO questions from this section.

Please, note that if you answer more than two questions, only the first two will be marked.

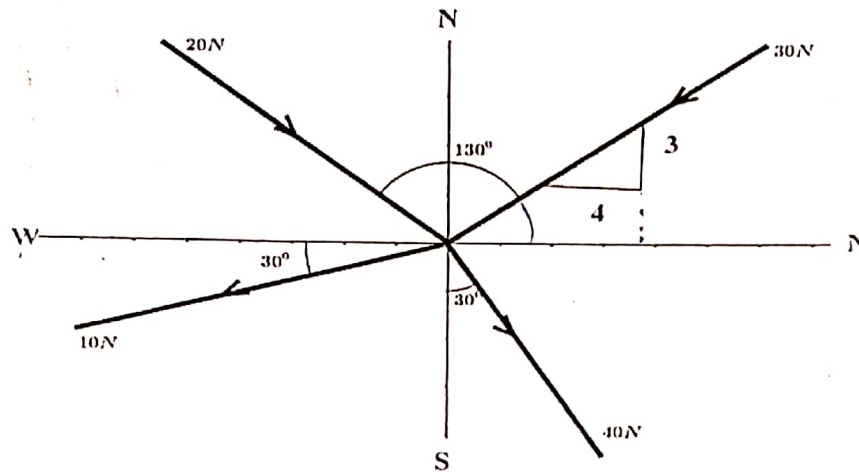
1.

- Two forces \overline{AB} and \overline{AD} are acting at the vertex A of a quadrilateral $ABCD$ and two forces \overline{CB} and \overline{CD} at C . Prove that their resultant is given by $\overline{4EF}$, where E and F are the midpoints of AC and BD respectively. (8 marks)
- A uniform beam, AB , of mass 40 kg and length 5 m, rests horizontally on supports at C and D where $AC = DB = 1$ m. When a man of mass 80 kg stands on the beam at E , the magnitude of the reaction at D is double the reaction at C . With the aid of a diagram, find the distance AE . [Take $g = 10 \text{ ms}^{-2}$] (12 marks)
- Find the area of the triangle with vertices $P(1, 4, 6)$, $Q(-2, 5, -1)$ and $R(1, -1, 1)$. (10 marks)

2.

- If the vectors $a = 2i + 3j$ and $b = mi - 6j$ are perpendicular, find the value of m . (5 marks)
- Two ships A and B leave a port simultaneously. Ship A steams at 10 kmh^{-1} on a bearing of 160° and B steams on a bearing of 215° . Just after one hour the bearing of B from A is 260° . Find the speed of B from the port, correct to two significant figures. (10 marks)

- c. Obtain the resultant of the concurrent coplanar forces acting at a point as shown in the figure below. (15 marks)



3.

- a. A, B, and C are the vertices of a triangle with position vectors: $a=3i-4j-4k$, $b=2i-j+k$ and $c=i-3j-5k$ respectively.
- i. Show that the vertices A, B and C form a right-angled triangle. (8 marks)
 - ii. Calculate the area of the triangle ABC. (4 marks)
- b. A body of mass 5 kg is placed on a smooth plane that is inclined to the horizontal at an angle of 30° . Calculate the:
- i. reaction force perpendicular to the plane. (6 marks)
 - ii. resultant force acting down the plane. (6 marks)
 - iii. acceleration of the body. (6 marks)
- [Take $g = 10 \text{ ms}^{-2}$]