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CENTRAL EAST EDUCATION DIVISION

2025 MSCE MOCK EXAMINATION

ADDITIONAL MATHEMATICS

Thursday, 20 March

Subject Number: M132/II

Time allowed: 2 hrs 30 min

01:00 – 03:30 pm

PAPER II

(100 marks)

Instructions

1. This paper contains 13 printed pages. Please check.
2. Before beginning to answer these questions write your **Full Name** in the spaces provided at the top of every page of the question paper.
3. Answer **all** the **six** questions in **section A** and any **two** from **section B** the spaces provided.
4. **Section A** carries 60 marks and **Section B** carries 40 marks
5. Use of electronic calculators is allowed
6. All answers should be written in the space provided after every question.
7. **All necessary working should be shown** and any numerical expression being evaluated by calculators must be clearly stated; otherwise marks for the method may be lost.
8. The **final** answer to a question requiring the use of tables or calculators should normally be given to three significant figures.
9. In the table provided on this page, **tick** against the number of the question you have answered.
10. The marks allocated to question (or part of a question) are shown in brackets at the end of each question (or part of a question).



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Section A (60marks)

Answer all the seven questions in this section

1. (a) Express the series $\frac{x^3}{2} - \frac{x^5}{3} + \frac{x^7}{4} - \frac{x^9}{5} + \dots + \frac{x^{199}}{100}$ in sigma notation **(5marks)**

(b) Given that $P = \begin{bmatrix} 4+x & 2+4x \\ 6 & 7 \end{bmatrix}$ and $Q = \begin{bmatrix} 3x+2 & 6 \\ 7-x & 7 \end{bmatrix}$, find the determinant of Q, if matrices P and Q are equal **(5marks)**

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2 (a) Determine whether the series $\sum_{x=1}^{\infty} \left(\frac{4x^2-1}{1-2x} \right)$ converges or diverges. **(5marks)**

(b) Find the angle of projection when a rocket fired with a speed of 25 m/s lands 25m away from the point of projection. **(6marks)**

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3(a) Given that $\mathbf{a} = 2\mathbf{i} - 3\mathbf{j}$ and $\mathbf{b} = 2\mathbf{i} + 6\mathbf{j}$, find the value of the scalar t for which

$\mathbf{a} + \mathbf{b}$ is perpendicular to $3\mathbf{i} + 4\mathbf{j} + t(4\mathbf{i} + 3\mathbf{j})$. (7marks)

3. (b) Evaluate $\sum_{i=1}^5 2i + \sum_{i=10}^{15} 12$ (4marks)

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4(a) Find the semi interquartile range of the data 45, 60, 59, 117, 47, 11, 94, 53, 52, 49, 50.

(5 marks)

(b) The points $A(1,0)$, $B(8,7)$ and $C(7,8)$ lie on the circumference of a circle. If AB is perpendicular to BC , find the equation of the circle. **(5marks)**

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5. Two forces of 60N and 85N act in the same plane on a block at angles of 285° and 235° respectively. Given that the block accelerates at a constant rate of 1.5m/s/s , calculate the mass of the block. **(6marks)**

6. The events A and B are such that $P(A) = 0.72$ and $P(B) = 0.56$. Given that $(A' \cap B') = 0$, determine $(A \mid B)$. **(6 marks)**



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7. **Figure 1** shows triangle OAB . M and N are the midpoints of $\overrightarrow{OA}$ and $\overrightarrow{OB}$ respectively.

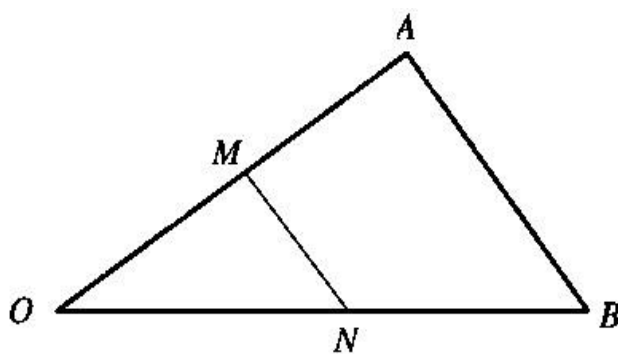


Figure 1

Given that $\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$, show that $\overrightarrow{AB}$ is parallel to $\overrightarrow{MN}$ (6marks)

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Section B (40marks)

Answer any two questions from this section

8. (a) **Figure 2** below shows a circle drawn on the xy-plane.

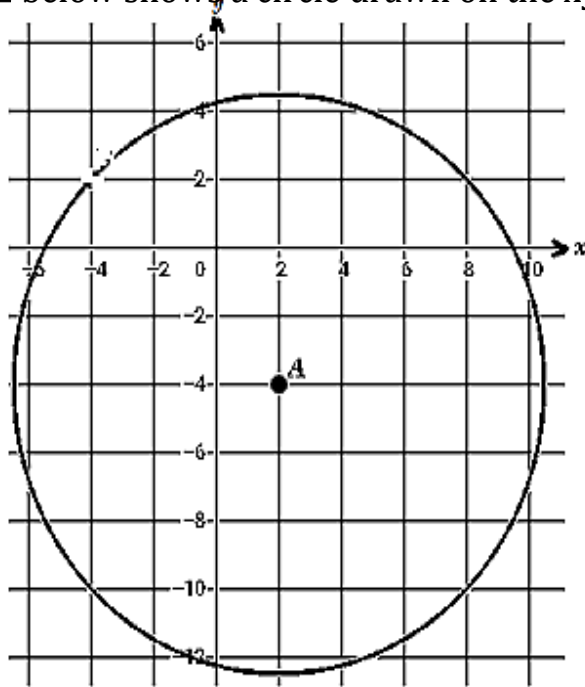


Figure 2

Given that **A** is the centre of the circle, show that the point $(7, \sqrt{47} - 4)$ lies on the circumference of this circle. **(10marks)**

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(b) A straight road running down a hill makes an angle of 30° with the horizontal. A driver driving a truck down the road observes a bull which suddenly jumps into the road 100m away and applies brakes stopping the truck 2m away from the bull. Given that the coefficient of friction between the truck and the road is 0.5 calculate the velocity of the truck when the bull jumped into the road. **(10marks)**

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9.(a) The table below shows age ranges(A) of students in a class.

Age (A)	$0 \leq A < 20$	$20 \leq A < 40$	$40 \leq A < 60$	$60 \leq A < 80$	$80 \leq A < 100$
Freq.	11	17	12	7	3

Calculate the standard deviation of the data.

(12marks)

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(b) Four forces FN , $10N$, $8N$ and $7N$ act on a mass as shown in **Figure 3** below.

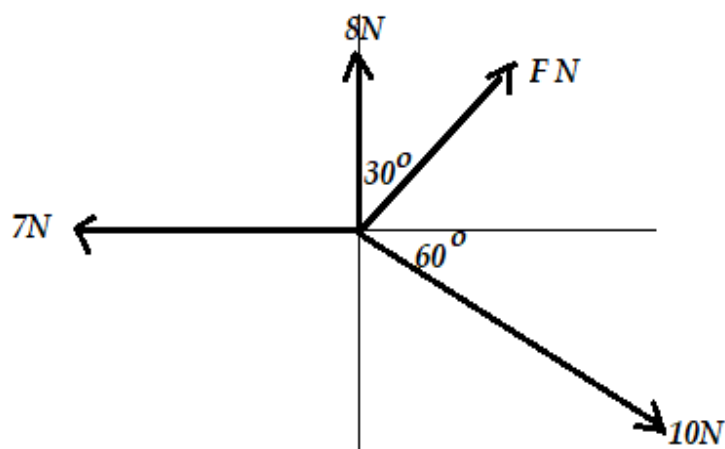


Figure 3

Given that the resultant of the forces is $4.54N$ at 77.6° to positive OX axis, calculate the value of F . **(8marks)**

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10. (a) Find the point at which the vector through $\begin{pmatrix} 1 \\ 3 \end{pmatrix}$ and $\begin{pmatrix} 5 \\ 6 \end{pmatrix}$ intersects the vector through $\begin{pmatrix} 4 \\ 1 \end{pmatrix}$ and $\begin{pmatrix} -2 \\ 5 \end{pmatrix}$. **(10marks)**



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- (b) A projectile is thrown from the top of a building 60m high at an angle of 30° to the horizontal. Given that the initial speed of the projectile is 10m/s, calculate velocity of the projectile on hitting the ground. **(10marks)**

END OF QUESTION PAPER

NB: This paper contains 13 printed papers.

