



# THE MALAWI NATIONAL EXAMINATIONS BOARD

2004 MALAWI SCHOOL CERTIFICATE OF EDUCATION EXAMINATION

## ADDITIONAL MATHEMATICS

Wednesday 27 October

Subject Number: M132/II

Time Allowed: 2 h 30 mins  
8:30 – 11:00 am

### PAPER II (100 marks)

#### Instructions

1. This paper contains 6 pages. Please check.
2. Answer all six questions in Section A and two questions from Section B.
3. Section A carries 60 marks and Section B carries 40 marks.
4. Graph paper and four-figure mathematical tables will be provided.
5. Calculators may be used.
6. All necessary working should be shown and any numerical expression being evaluated by calculators or mathematical tables must be clearly stated; otherwise marks for method may be lost.
7. The final answer to a question requiring the use of tables or calculators should normally be given to three significant figures.
8. The marks allocated to each question (or part of a question) are shown in brackets at the end of each question (or part of a question).
9. Write your Examination Number on each of your answer sheets.

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Turn over



## Section A (60 marks)

Answer all six questions in this section.

1. Show that lines joining points A(1, 6), B(-1, 4) and C(2, 1) form a right-angled triangle. (8 marks)
2. An integer is chosen randomly from the set  $\{4, 5, 6, \dots, 17, 18\}$ . If E is the event of choosing an even number and M is the event of choosing a multiple of 3, find
  - a.  $P(E \cap M)$  (3 marks)
  - b.  $P(E \cup M)$  (3 marks)
  - c.  $P(E' \cap M)$  (4 marks)
3. The position vectors of points R and T relative to the origin O are  $\vec{OR} = i - 2j + 7k$  and  $\vec{OT} = 5i + j - 5k$ . Find
  - a. the distance between the origin and point R. (3 marks)
  - b. vector RT. (3 marks)
  - c. the position vector of the midpoint of  $\vec{OR}$ . (3 marks)
4. A body of mass 10 kg has an initial velocity of  $(i + 4j)$  m/s. When a constant force has acted on the body for 5 seconds the velocity is  $(5i + 2j)$  m/s. Calculate the value of the force. (6 marks)
5. a. Figure 1 shows three forces acting on a body of mass M.

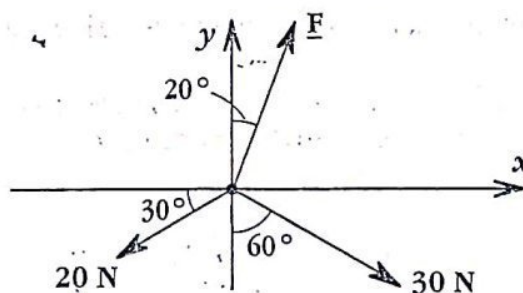


Figure 1

- If the three forces have a zero resultant force in the y-axis, calculate the value of F. (7 marks)
- b. The position vectors of points P and N, are  $3i - 4j + 5k$  and  $i - k$  respectively. If N is between P and Q such that  $PN:NQ = 2:3$ , calculate the position vector of point Q. (6 marks)

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6. a. Figure 2 is a pie chart showing proportions of farm land allocated to different crops.

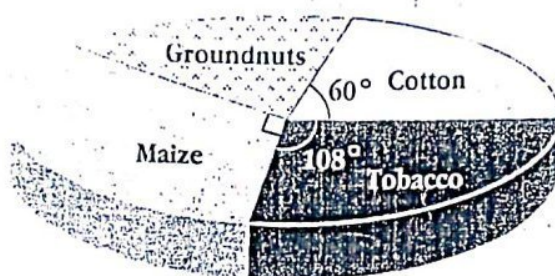


Figure 2

If the total area under cotton is 50 ha, find:

- (i) the total area of the farm. (3 marks)
  - (ii) area allocated to groundnuts. (5 marks)
- ×b. A particle of mass 5 kg is pulled along a smooth horizontal plane using a rope. The rope is inclined at  $60^\circ$  to the horizontal plane. If the acceleration is  $4 \text{ ms}^{-2}$ , calculate the tension in the rope. (6 marks)

### Section B (40 marks)

Answer any **two** questions from this section.

7. a. A particle of mass 2 kg initially at rest is accelerated by a 6 N force for 5 seconds. The particle is then brought to a rest in a further 8 seconds.
- (i) Calculate the acceleration during the first 5 seconds. (2 marks)
  - (ii) Calculate the highest speed attained. (2 marks)
  - (iii) Sketch the speed-time graph for the particle. (4 marks)
  - (iv) Calculate the total distance covered during the motion. (2 marks)
- b. Figure 3 shows points F, G and H whose position vectors are  $4\mathbf{i} - \mathbf{k}$ ,  $\mathbf{i} + 2\mathbf{j} - \mathbf{k}$  and  $3\mathbf{i} + 3\mathbf{j} - 6\mathbf{k}$  respectively.

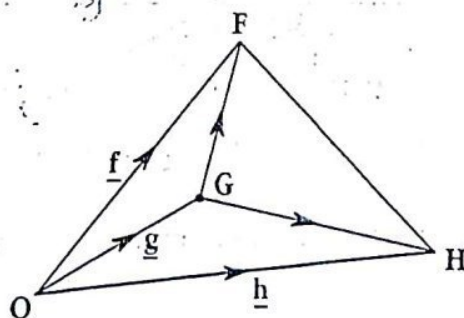


Figure 3

- (i) Show that vectors  $\vec{GF}$  and  $\vec{GH}$  are perpendicular to each other.
- (ii) Calculate the value of angle GHO. (10 marks)

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8. a. Find the equation of the tangent to the circle  $x^2 + y^2 - 4x + 10y - 8 = 0$  at the point (3,1). (10 marks)
- b. Given the points A(2,3), B(2,4) and C(5, -1), find
- (i) the equation of a line which passes through A and is perpendicular to BC. (5 marks)
- (ii) the equation of a line passing through B to the mid-point of AC. (5 marks)
9. a. A straight line passes through the point with position vector  $2\mathbf{i} - \mathbf{j}$  and is parallel to the vector  $\mathbf{i} - 3\mathbf{j}$ . Using vector approach, find the point where the line intersects the line  $y = x$ . (8 marks)
- b. A student takes two tests, one on numerical ability and the other on reasoning skills. In the numerical ability test, the probabilities of getting a pass with distinction, a mere pass and a fail are 0.10, 0.60 and 0.30 respectively. The corresponding probabilities in the reasoning ability test are 0.20, 0.29 and 0.51.
- (i) Draw a tree diagram to illustrate the possible results the student can get.
- (ii) Using the tree diagram, calculate the probability that the student will pass with distinction in the numerical ability test and fail in the reasoning skills test.
- (iii) Calculate the probability that the candidate will get the same result in both tests. (12 marks)
10. The table below shows masses of 30 people which were obtained from a sports team.
- |           |       |       |       |       |       |       |       |        |
|-----------|-------|-------|-------|-------|-------|-------|-------|--------|
| Mass (kg) | 21-30 | 31-40 | 41-50 | 51-60 | 61-70 | 71-80 | 81-90 | 91-100 |
| Freq.     | 0     | 1     | 1     | 3     | 6     | 9     | 7     | 3      |
- a. Calculate the mean mass. (5 marks)
- b. (i) construct a cumulative frequency table.
- (ii) Draw a cumulative frequency curve.
- (iii) Estimate:
- (1) the median.
- (2) the inter-quartile range. (15 marks)

**END OF QUESTION PAPER**

**NB: This paper contains 4 pages.**

