EXAMINATION PRACTICE 3

CANDIDATE NAME	ENGLISH	CHINESE

Date | **Candidate No.**

MATHEMATICS **9709/04**

Paper 4 Mechanics

30 Minutes

You must answer on this question paper.

You will need: List of formulae (MF19)

READ THESE INSTRUCTIONS FIRST

- Answer **all** questions.
- Write your name, date & class on all the work you hand in.
- Write in dark blue or black pen.
- You may use an HB pencil for any diagrams or graphs.
- Do not use staples, paper clips, glue, or correction fluid.
- Write your answer to each question in the space provided.
- If additional space is needed, you should use the lined page at the end of this booklet; the question number or numbers must be clearly shown.
- Where a numerical value for the acceleration due to gravity is needed, **use 10 m s^{-2}**.
- You must show all necessary working clearly; no marks will be given for unsupported answers from a calculator.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.

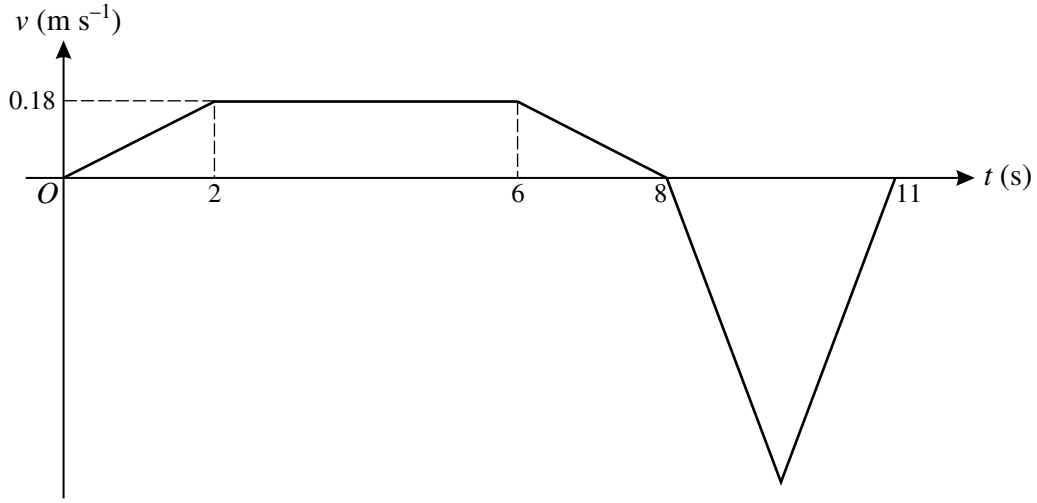
INFORMATION

- The total mark for this paper is **21**.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **12** pages. Blank pages are indicated.

1 A car of mass 1150 kg travels up a straight hill inclined at 1.2° to the horizontal. The resistance to motion of the car is 975 N. Find the acceleration of the car at an instant when it is moving with speed $16\,\text{m}\,\text{s}^{-1}$ and the engine is working at a power of 35 kW. [4]

2



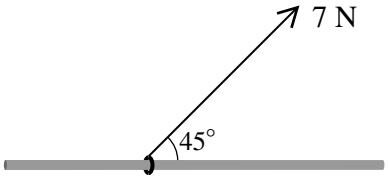
The diagram shows the velocity-time graph for the motion of a machine's cutting tool. The graph consists of five straight line segments. The tool moves forward for 8 s while cutting and then takes 3 s to return to its starting position. Find

(i) the acceleration of the tool during the first 2 s of the motion, [1]

(ii) the distance the tool moves forward while cutting, [2]

(iii) the greatest speed of the tool during the return to its starting position. [2]

3

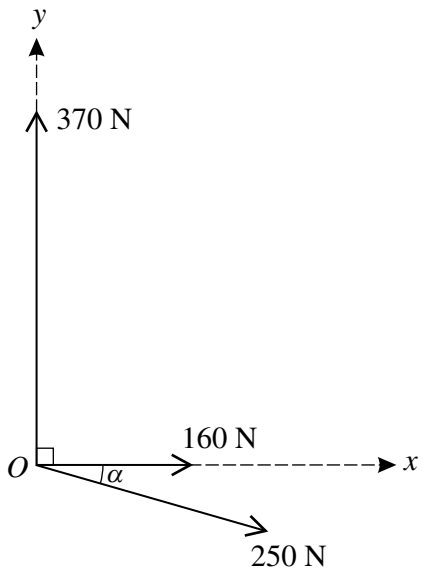


A small ring of mass 0.8 kg is threaded on a rough rod which is fixed horizontally. The ring is in equilibrium, acted on by a force of magnitude 7 N pulling upwards at 45° to the horizontal (see diagram).

(i) Show that the normal component of the contact force acting on the ring has magnitude 3.05 N, correct to 3 significant figures. [2]

(ii) The ring is in limiting equilibrium. Find the coefficient of friction between the ring and the rod. [3]

4



Coplanar forces of magnitudes 250 N, 160 N and 370 N act at a point O in the directions shown in the diagram, where the angle α is such that $\sin \alpha = 0.28$ and $\cos \alpha = 0.96$. Calculate the magnitude of the resultant of the three forces. Calculate also the angle that the resultant makes with the x-direction.

[7]