

Tuesday 10 June 2025 – Afternoon

Level 3 Cambridge Technical in Engineering

05873 Unit 24: Project management for engineers

Time allowed: 2 hours

C307/2506

You must have:

- a calculator



Please write clearly in black ink. **Do not write in the barcodes.**

Centre number

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Candidate number

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First name(s)

Last name

Date of birth

D	D	M	M	Y	Y	Y	Y
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INSTRUCTIONS

- Use black ink. You can use an HB pencil, but only for graphs and diagrams.
- Write your answer to each question in the space provided. If you need extra space use the lined pages at the end of this booklet. The question numbers must be clearly shown.
- Answer **all** the questions.

INFORMATION

- The total mark for this paper is **80**.
- The marks for each question are shown in brackets [].
- This document has **20** pages.

ADVICE

- Read each question carefully before you start your answer.

Text 1

Hawkins Ltd is an engineering company based in Shropshire. The company manufactures precision components for the aerospace industry. It specialises in the milling of aluminium hinges, latches, gearbox housings and chassis parts. All components must be made to the exact specifications of its industrial customers, often with tolerances of 0.1 mm.

Amos Hawkins, son of the company's founder, was appointed as Hawkins Ltd's Chief Executive Officer (CEO) in January 2020. Amos had worked as an engineer in the family business for over 30 years. He was eager to modernise the company and immediately initiated a project to automate production. However, the project did not go well: the project manager did not have the required expertise, the project team members lacked basic training on their roles, company employees threatened to go on strike over concerns about job security, negative publicity about the company appeared in the media and industrial customers diverted orders elsewhere due to concerns about reliability of supply. Amos realised he had made a huge mistake. The project was abandoned before completion.

Five years on, revenue and profit levels remain low, and costs are rising rapidly. The company has hardly any money in its bank account and is struggling to pay its monthly bills on time. Amos has decided that the company must now invest in the latest CNC milling machines.

CNC milling machines will drill and cut in a single operation. This means that complex parts can be made as a single unit, significantly reducing assembly time and production cost. The accuracy of CNC machines should ensure that all components match their specifications and are fit for purpose, reducing wastage and improving reputation. CNC machines work at high speeds, facilitating greater output, orders permitting. Hawkins Ltd may even be able to secure orders from outside the aerospace industry, possibly producing components for the automotive, rail transport and shipping industries.

Amos has commissioned a new project. The required deliverable is to operate three CNC milling machines. Amos and the company's two directors comprise the project's steering committee, with Amos as project sponsor. The budget has been set at £2 million and will be funded by a 25-year commercial bank loan with a variable interest rate. The key control for the project is 'cost'.

Ivan, Hawkins Ltd's Quality Lead, has been assigned as project manager. Ivan, who gained a first-class honours degree in engineering in 2023, has worked for the company for just over a year. His degree course included a 6-month project management module which assessed Ivan's skills as a project manager. Ivan gained high marks. His tutor's feedback commented on his excellent planning skills and his thorough understanding of the importance of project monitoring.

The project team comprises 12 members:

- Ivan as project manager
- two project team leaders – Orla and Umi – both long-serving employees who were involved in the previously abandoned project: Orla as a previous team leader and Umi as a team member
- a representative from Rigo plc – an IT contractor – chosen by the steering committee in advance of the project's initiation to supply and install the latest CNC milling machines
- eight other project team members – four engineers and four support staff (none of whom were involved in the previously abandoned project).

1 Use Text 1.

- (a)** Which **one** of the following activities is part of Ivan's role as project manager?

Tick (✓) **one** box.

- authorising the closure of the project
- chairing steering committee meetings
- providing financial support
- running the project on a day-to-day basis
- setting organisational aims and objectives

☐
☐
☐
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[1]

- (b)** As the key control for the project is cost, Ivan needs to try to avoid any budget overrun.

State what is meant by the term 'budget overrun'.

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..... **[1]**

- (c)** State **one** reason why the objectives that Ivan sets for the project should be:

- measurable

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- specific

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[2]

- (d)** State **four** items, other than the objectives of the project, that Ivan needs to include in the outline plan.

1

2

3

4

[4]

- (e) Explain **one** advantage and **one** disadvantage for Ivan of a representative from Rigo plc being part of the project team.

advantage

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disadvantage

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[6]

- (f) During the project's execution stage, a lot of monitoring will need to be done.
- (i) In the table below, identify with a tick (✓) **two** monitoring activities which will help Ivan track the progress of the project.

You should only tick **two** boxes.

Activities	Tick (✓)
Analysing completion figures and complaints	
Identifying the scale and scope of the project	
Making proactive and reactive adjustments	
Obtaining final acceptance of project completion	
Producing project initiation documentation	
Receiving frequent reports from team leaders	
Using project management tools	

[2]

(ii) Ivan will also need to monitor external factors.

Explain how changes in each of the following could **negatively** affect the outcomes of the project.

- economic factors
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- market size
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[6]

Text 2

Ivan was told by his degree tutor that he has excellent planning skills. However, Ivan is less confident about the other skills he will need to manage the project effectively.

Ivan has produced a Gantt chart scheduling the implementation stage of the project.

2 Use Text 2.

(a) Refer to Ivan's Gantt chart on **page 7**.

(i) What is the scheduled duration of 'Activity B: Technical assessment'?

..... [1]

(ii) Which activity is scheduled to take place in week 12?

..... [1]

(iii) Which activities are scheduled to start during the same week as 'Activity I: Update IT infrastructure'?

..... [1]

(iv) Ivan thinks that 'Activity M: Test production' is a critical activity. Explain whether Ivan is correct.

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(v) Explain what impact there would be on the duration of the implementation stage of the project if 'Activity F: Manage industrial relations' only takes 2 weeks.

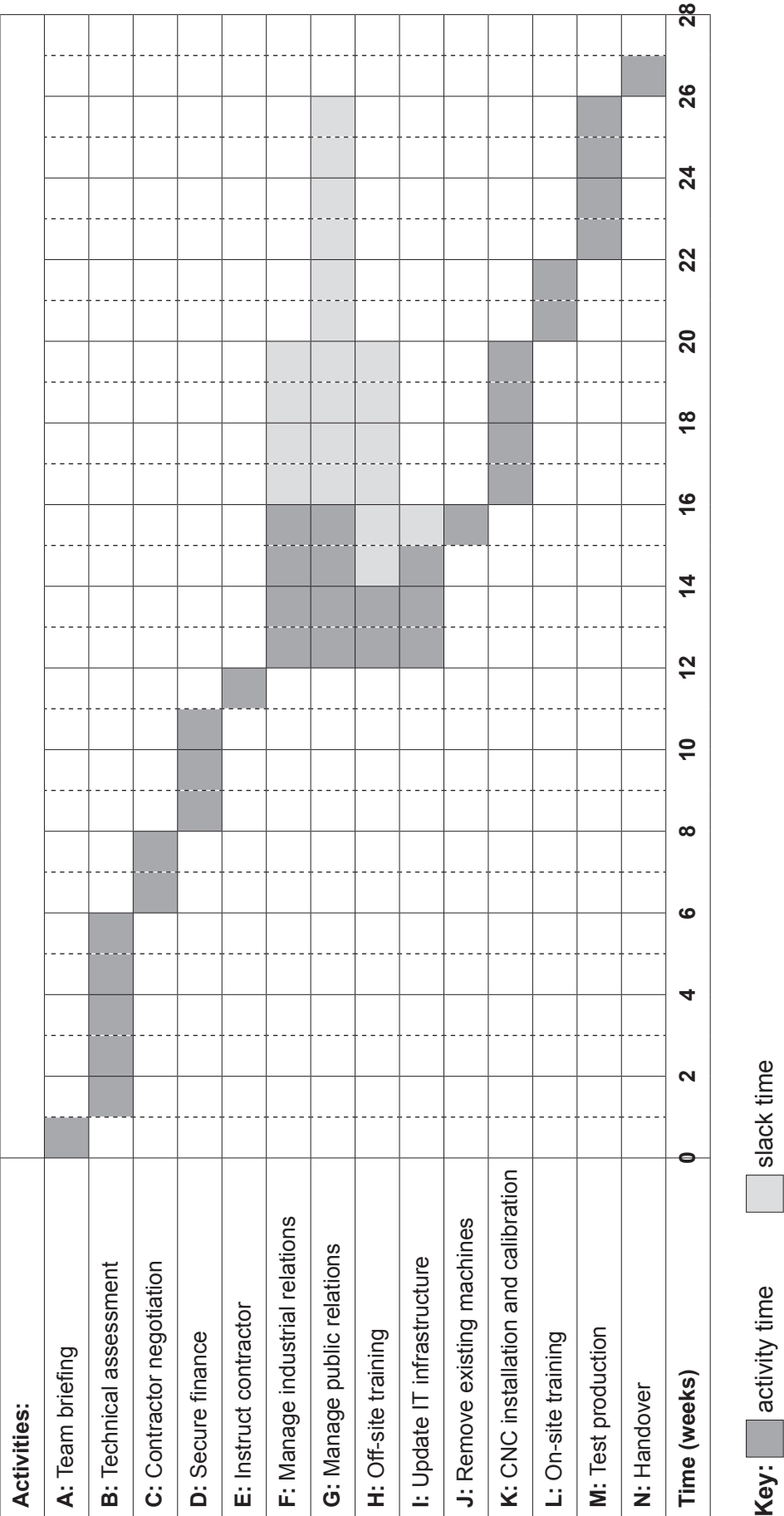
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Gantt chart for the implementation stage of the project



- (vi) Calculate the minimum completion time for the implementation of the project if 'Activity H: Off-site training' is delayed by 8 weeks.

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- (b)** Ivan uses PERT to help plan for contingencies.

His calculations suggest:

- 'most likely time': 30 weeks
- 'pessimistic time': 90% longer than 'most likely time'
- 'optimistic time': 30% shorter than 'most likely time'.

Using PERT, calculate the estimated expected duration of this project.

Show your workings.

[6]

(c) Explain why this project needs a contingency plan.

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(d) Describe **two** skills, other than planning skills, that Ivan will need to manage the project effectively.

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Text 3

Ivan monitored the implementation stage of the project very carefully. He made fast decisions and took decisive action when project control was required. Three of the events that required project control are listed below.

Event 1: During 'Activity I: Update IT infrastructure', the IT contractor encountered problems when routing the internet cables and requested an urgent meeting with Ivan to approve changes to the plan.

Event 2: Both team leaders submitted issue logs regarding a clash of meetings. As part of 'Activity F: Manage industrial relations', Orla had invited all 46 of Hawkins Ltd's employees to a meeting to reduce workforce concerns. As part of 'Activity G: Manage public relations', Umi had invited local and national media to a public meeting. Both team leaders had arranged their meetings for the same date, the same time and the same venue (Hawkins Ltd's only conference room). In addition, invitations to both meetings said that the CEO, Amos, would be in attendance for the entire meeting.

Event 3: During 'Activity M: Test production', CNC Machine 1 was programmed to produce 80 000 LL56 hinges. To pass the test, the length of at least 99.8% of the hinges needed to be within the control limits.

The results of the LL56 test on CNC Machine 1 are shown in **Table 1** below.

Table 1

Length of hinge in millimetres (x)	55.8	55.9	56.0	56.1	56.2	56.3
Frequency	103	7573	72 000	227	0	97

3 Use Text 3.

- (a) Explain, using **Event 1**, the difference between project monitoring and project control.

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- (b) Explain **two** actions Ivan could have taken to manage the competing priorities for resources in **Event 2**.

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- (c) The lengths of the LL56 hinges produced under test conditions in **Event 3** are shown in **Table 1** (repeated below).

Table 1

Length of hinge in millimetres (x)	55.8	55.9	56.0	56.1	56.2	56.3
Frequency	103	7573	72000	227	0	97

The control limits for the length (x) of each of the LL56 hinges are $55.9 \leq \bar{x} \leq 56.1$ millimetres and the requirement is that at least 99.8% of lengths are within the range.

Complete the control report by giving:

- details of the test
- details of the findings
- a decision on whether the test has been passed or failed
- recommended next steps.

Control report: 5214		Completed by:	
Details of test:			
Details of findings: Show your workings.			
Test results: Please tick (✓) one option only.	PASS ☐	FAIL ☐	
Recommended next steps:			

Text 4

While Ivan waits for the test results for CNC Machines 2 and 3, his thoughts turn to the final stage of the project. He decides that he will use printed questionnaires rather than a series of meetings to collect feedback at the end of the project. He hopes that this feedback will be useful for everyone involved with projects in the company including himself, the rest of the project team, Amos, the two directors and the company as a whole.

4 Use Text 4.

- (a) Analyse **one** advantage and **one** disadvantage for Hawkins Ltd of Ivan's decision to use printed questionnaires rather than meetings to collect feedback at the end of the project.

advantage

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disadvantage

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[6]

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END OF QUESTION PAPER

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