

Friday 7 June 2024 – Afternoon
Level 3 Cambridge Technical in Engineering
05873 Unit 24: Project management for engineers
Time allowed: 2 hours
C307/2406



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

Hedgerow Tea Ltd, owned by Finley Carter and Gabi Bainbridge, manufactures premium quality herbal tea bags. Mint tea, strawberry tea, lavender tea and nettle tea are its best sellers.

The company employs 40 workers and makes approximately 500 000 tea bags per day. It buys its herbs from farmers across the UK and processes these into round tea bags, with a string and branded tag, at its factory in Lincolnshire. The customers of Hedgerow Tea Ltd include leading supermarkets and health food shops across the UK and mainland Europe.

As the popularity of herbal tea increased between 2010 and 2018, Hedgerow Tea Ltd sales increased from £2 million per year to £10 million per year. However, from 2018 the company's sales have been falling, despite a sharp increase in market size. End users appear to be favouring other herbal tea bag brands. The company has been unable to deal with the strength of competition. Profits of £5 million were expected, but profits have now fallen below £1 million per year.

Research shows that the company's lack of environmentally friendly credentials is the main cause of the fall in sales, despite the tea itself being 100% natural.

Finley and Gabi have initiated three formal projects to improve the environmentally friendly credentials of the company. Each project has its own Project Manager.

Project A will concentrate on logistics.

Project B will concentrate on packaging.

Project C will concentrate on the tea bag product itself.

Finance Manager, Riley Maya, is the designated resource holder for all three projects. The budget is flexible, with each project competing for resources with the other two projects. The critical control for the projects is 'time'. The joint steering committee (comprising Finley, Gabi and Riley) will host meetings fortnightly. All three Project Managers will be required to attend, because decisions made about one project may affect one or more of the other projects.

Casey Murphy, an engineer, has been assigned as Project Manager for Project C. In common with most manufacturers of round tea bags, the company's tea bags are sealed (so that they do not come apart in boiling water) with polypropylene (a plastic). Casey's brief is to upgrade the company's manufacturing process so that all tea bags are plastic-free.

Each Project Manager has been assigned five team members. Casey's team comprises: three long-serving production supervisors (one due to retire next year, one on a part-time contract and one eager for promotion) and two recently appointed engineering graduates (one who appears quite uncooperative and one who appears to be quiet and reserved).

Casey has worked at the company for six months and, unlike the other two Project Managers, has no experience of being part of a formal project, not even as a team member. Casey has requested the support of an external consultant who specialises in project management.

1 Refer to Text 1.

- (a)** Due to the strength of competition, sales of Hedgerow Tea Ltd continue to fall despite an increase in market size.

State what each of the following means.

Strength of competition

.....

Market size

.....

[2]

- (b)** Ryan Rigg, a specialist in the roles and responsibilities of project management, has been commissioned as an external consultant to support Casey throughout the project.

State **one** likely positive impact and **one** likely negative impact on the outcomes of Project C of commissioning Ryan to support Casey.

Positive impact

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Negative impact

.....

[2]

- (c) Ryan explains to Casey that the four stages of project management – initiation, planning, implementation and closure – are consecutive and need to be carried out sequentially.

In the table below, identify with a tick (✓) at which stage of Project C, Casey will need to do each of the following activities.

You should only place **one** tick in each row.

	Project initiation	Project planning	Project implementation	Project closure
Manage project quality				
Issue frequent project execution reports				
Use project control techniques				
Conduct a project feasibility study				

[4]

- (d) State **two** key duties which Casey will have at the fortnightly joint steering committee meeting.

1

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2

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[2]

- (e) Analyse **three** skills that Casey will need to use to manage Project C effectively.

Which **one** of these skills is likely to be the most important? Justify your selection.

[12]

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Text 2

With the help of Ryan, Casey successfully completes the first stage of Project C, project initiation, and attends the first two steering committee meetings.

Casey then begins working on the second stage of Project C, project planning.

2 Refer to Text 2.

(a) State **two** items that Casey should include in the following planning documents.

- Quality plan

1

2

- Risk analysis

1

2

- Project schedule

1

2

[6]

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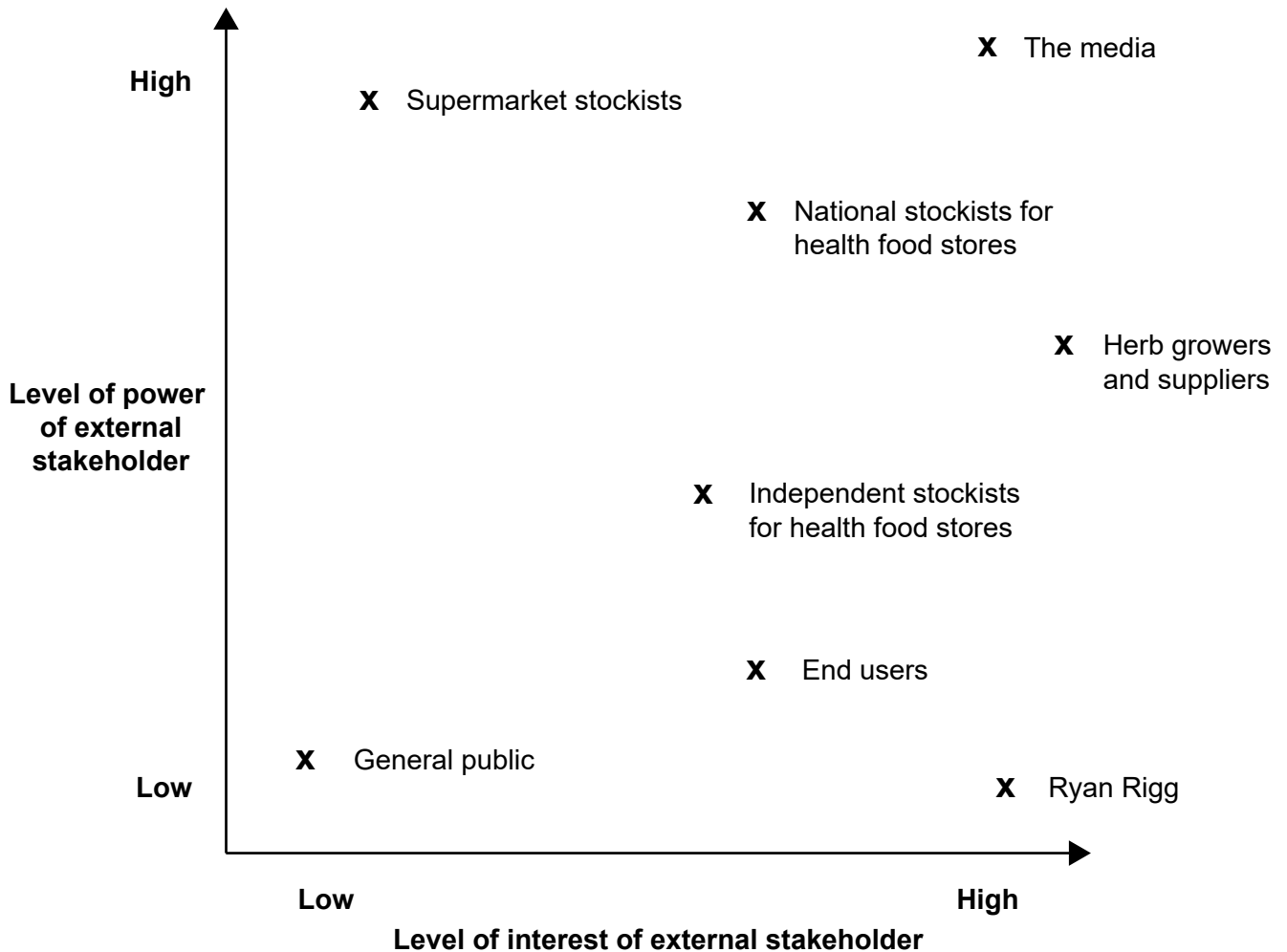
PLEASE DO NOT WRITE ON THIS PAGE

Turn over for the next question

(b) Casey draws the graph below to show:

- the level of interest
- the level of power

of the main external stakeholders in Project C.



(i) What does the term 'end user' mean?

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..... [1]

(ii) Explain how Casey should manage each of the following external stakeholders based on the levels of power and interest shown in the graph.

- The media

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- Supermarket stockists

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[6]

(iii) Casey is concerned about the validity of the information represented on the graph.

Explain **one** reason why the information represented on the graph might not be valid with consideration of:

- Reliability

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- Degree of detail

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[4]

Text 3

Casey understands the urgency of upgrading the company's manufacturing process so that the tea bags are plastic-free. The company is losing more sales with every month that passes.

To monitor the progress of the third stage of the project (project implementation), Casey decides to use a Gantt chart and critical path analysis.

Casey intends to complete the implementation stage of Project C in the shortest possible time. The duration of this stage needs to be estimated.

3 Refer to Text 3.

- (a) The Gantt chart that Casey produces includes concurrent activities, critical activities, and activities with slack time.

Explain **one** advantage for the project of Casey identifying each of the following.

- Activities that can be done concurrently

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- Critical activities

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- The amount of slack time an activity has

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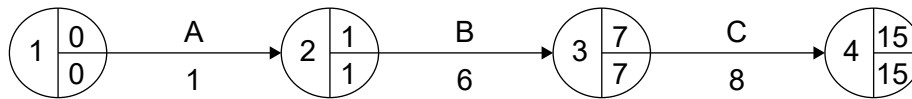
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[6]

- (b) Below is an extract from the critical path network diagram that Casey produces for the implementation stage of Project C.



Activity key:

A: Kick-off meeting

B: Technical audit

C: Research and development meetings

Duration: All timings are in weeks

- (i) Use the extract from the critical path diagram to identify the following.

- The earliest start time for 'Activity A: Kick-off meeting'

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- The latest finish time for 'Activity B: Technical audit'

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[2]

- (ii) Use the information on the extract from the critical path diagram to explain whether any or all of Activities A, B and C are on the project's critical path.

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..... **[3]**

- (c) Casey estimates that the 'most likely time' for the duration of the implementation stage of Project C is 50 weeks. Ryan explains that using PERT would give a more realistic estimate.

Casey suggests the following adjustments.

- 'Optimistic time' = 90% of 'most likely time'
- 'Pessimistic time' = 180% of 'most likely time'

Using the suggested adjustments, calculate the PERT 'estimated expected time' for the duration of the implementation stage of Project C.

[6]

- (d) With the scheduled date for Project C's kick-off meeting being Friday next week, Casey sends an email to book one of the company's two meeting rooms for the full day.

Casey discovers that the Project Managers for Project A and Project B have already booked both of the company's meeting rooms for that day. As a result, Casey's booking request has been unsuccessful.

- (i) Which type of resource constraint has Project C encountered?

Tick (✓) **one** box.

Consumables

☐

Equipment

☐

Premises

☐

Tools

☐

[1]

- (ii) To remedy the situation, Casey books a meeting room at a 4-star hotel 15 miles away. The room is booked for Friday next week from 8 am to 5 pm.

Explain **one** likely benefit and **one** likely drawback of this decision to the outcomes of Project C.

Benefit

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Drawback

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[4]

Text 4

The steering committee has authorised Casey to go ahead with proposed changes to the company's manufacturing process. The round tea bags which are sealed with polypropylene will be replaced with pyramid-shaped mesh bags made from plant starch. The new plastic-free tea bags will be sealed using string made from ethically sourced cotton and attached to a branded tag made from recycled wood pulp.

A contractor has been commissioned to change the manufacturing process. Test quantities of raw materials have been purchased. The new manufacturing process is now being tested.

Today, the machinery has been calibrated to make herbal mint tea bags.

Table 1 shows the masses of the herbal mint tea bags produced under test conditions.

Table 1

Mass in grams (<i>m</i>)	1.71	1.72	1.73	1.74	1.75
Frequency (<i>f</i>)	12 000	28 000	90 000	62 000	58 000

4 Refer to Text 4.

- (a) Casey uses secondary research sources, rather than primary research, to help find a contractor for the work to change the manufacturing process.

Analyse **one** likely advantage and **one** likely disadvantage for Hedgerow Tea Ltd of using secondary research, rather than primary research.

Advantage

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Disadvantage

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[6]

- (b) The control limits for the mean mass (\bar{m}) of the new plastic-free herbal mint tea bags are $17.1 \leq \bar{m} < 1.73$ grams.

The masses of the herbal mint tea bags produced under test conditions are shown in **Table 1**.

Complete the unshaded boxes in the report form below to give:

- Details of the test
- Details of the findings
- A decision on whether the test has been passed or failed.

Report number: 1356	Completed by:	
Details of test:		
Details of findings: Show all your working.		
Test results: Please tick (✓) one option only.	PASS - results are within the specified control limits. <input type="checkbox"/>	FAIL - results are outside of the specified control limits. <input type="checkbox"/>

[5]

- (c) While Casey waits for further tests to be completed on the plastic-free tea bags, thoughts turn to the final stage of Project C – project closure.
- (i) In the table below, identify with a tick (✓) which **two** activities Casey should undertake during project closure.

You should only tick **two** boxes.

Activities:	Tick (✓)
Agree sources of finance	
Amend aims and objectives	
Make proactive and reactive adjustments	
Negotiate deliverables	
Obtain acceptance of completion	
Review lessons learned	
Update the contingency plan	

[2]

- (ii) Explain **one** way that feedback from Casey at the end of the project could be used to improve the way Hedgerow Tea Ltd supports its future Project Managers.

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..... [2]

- (d) To measure the ongoing success of all three projects Finley and Gabi intend to use sales data and an analysis of customer complaints.

State whether complaints analysis is an objective feedback method or a subjective feedback method. Justify your answer.

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..... [4]

END OF QUESTION PAPER



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