OCR
Oxford Cambridge and RSA

Friday 18 January 2019 – Morning

LEVEL 3 CAMBRIDGE TECHNICAL IN ENGINEERING

05873 Unit 24: Project management for engineers

Duration: 2 hours

C307/1901

C307 – 1901

You must have:
- a calculator

First Name					Last Name			
Centre Number					Candidate Number			
Date of Birth	D	D	M	M	Y	Y	Y	Y

INSTRUCTIONS
- Use black ink. You may use an HB pencil for graphs and diagrams.
- Complete the boxes above with your name, centre number, candidate number and date of birth.
- Answer **all** the questions.
- Write your answer to each question in the space provided. If additional space is required, you should use the lined page(s) at the end of this booklet. The question number(s) must be clearly shown.

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

FOR EXAMINER USE ONLY	
Question No	**Mark**
1	/23
2	/17
3	/17
4	/23
Total	**/80**

Answer **all** the questions.

Text 1

Cumbrian Motors plc is a UK-based, internationally acclaimed, engineering business.

With over 60 years trading, it has built up an excellent reputation, specialising in the manufacture and maintenance of electric motors and generators for the railway and shipping industries. As a result, it is well-known for being at the forefront of innovation in transport industries. The business is profitable and secures good returns for its shareholders.

Cumbrian Motors plc has its headquarters, research and development facility, and main production site in the northwest of England. It has two additional factories: one in Northern Ireland and one in the highlands of Scotland.

In June 2016 Cumbrian Motors plc was one of a number of organisations contracted by the Aeronautical Board, a government advisory body for the aerospace industry, to undertake technological advancement projects on behalf of the aerospace industry. The Aeronautical Board wanted to reduce the environmental impact of air transportation by moving the aerospace industry away from petroleum-based aviation fuel to cleaner forms of power.

The project given to Cumbrian Motors plc by the Aeronautical Board, the project sponsor, is to develop a DC electric motor capable of co-powering a hybrid commercial passenger airliner, as a stepping stone to all-electric flight. The project is worth £65 million.

The directors of Cumbrian Motors plc assigned Kyren Liswoski, the company's Senior Manager for Research and Development, as project manager.

The project team comprises:

- Kyren as project manager (based at company headquarters in England)
- Two project team leaders (both electrical/mechanical engineers - one based at the factory in Northern Ireland and one based at the factory in Scotland)
- 30 other project team members (10 based at each of the company's three locations).

The project needed to be completed in time for the project deliverables to be presented at the Aeronautical Board's annual conference, in January 2019.

In previous years, the annual conference had attracted government regulatory bodies from around the world, leading aircraft manufacturers, renowned engineers, global trade organisations and the media.

To meet the January 2019 deadline, Kyren, used his excellent planning skills to factor a two-week contingency allowance into the project schedule.

1 Refer to Text 1.

(a) Kyren produced project initiation documentation at the start of the project.

The documentation was split into the following four sections:

- project proposal
- feasibility study
- project controls
- communication strategy.

(i) Which section of the project initiation documentation should explain the purpose of the project?

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

(ii) State **one** purpose of a communication strategy.

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

Question 1(b) begins on page 4

(b) Kyren used critical path analysis to manage the planning stage of the project.

(i) Complete the critical path network diagram given in **Fig. 1** by inserting the EST (earliest start times) and LFT (latest finish times) for nodes 3, 4 and 6 into blank spaces on the diagram. **[6]**

(ii) Calculate the float time for Task F: Resource plan.

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

(iii) Which activities were critical to the planning stage of the project being completed in the shortest possible time?

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

(iv) The planning stage of the project actually took 51 days to complete.

Calculate the amount of time creep during the planning stage of the project.

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

(c) The project sponsor praised Kyren for the quality of the planning documentation he produced.

(i) State **one** item which Kyren should have included in the quality plan.

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(ii) Explain **one** benefit to the project sponsor of Kyren's excellent planning skills.

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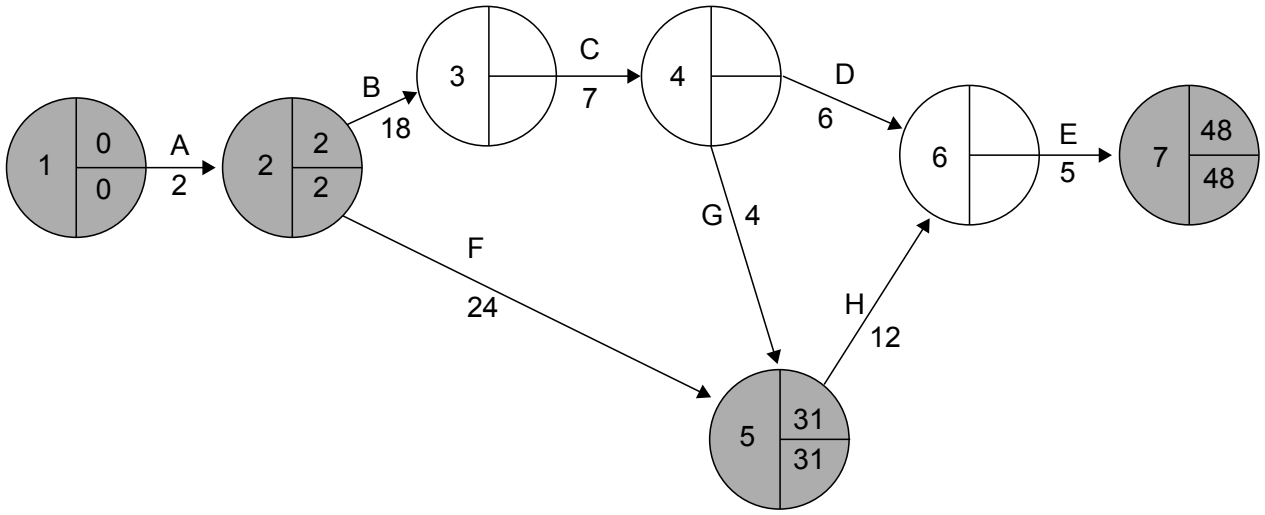
.....**[2]**

Critical path network diagram for the planning stage of the project



Task key:	
A: Outline plan	**E:** Financial plan
B: Stakeholder analysis	**F:** Resource plan
C: Risk analysis	**G:** Quality plan
D: Contingency plan	**H:** Project schedule
Duration: All timings are in days.	

Fig. 1

(d) Kyren used PERT to estimate how long the implementation stage of the project would take. He estimated:

- 'most likely time' = 50 weeks
- 'pessimistic time' = 40% more than 'most likely time'
- 'optimistic time' = 16% less than 'most likely time'.

Calculate, using PERT, the estimated expected duration of the implementation stage of the project. Show your workings.

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(e) Project outcomes can be affected by external factors.

For each of the following categories, state **one** external factor that could affect the outcome of major projects such as this.

Political .....

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Environmental.....

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Technological.....

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[3]

Text 2

Kyren knew that he could not neglect his routine duties as Senior Manager for Research and Development, as this might affect the company's reputation and profits.

To meet the demands of being project manager for such a large-scale project Kyren constantly prioritised his workload and delegated tasks when necessary.

The project went well for the first two years.

However, on 17th September 2018, shortly after conducting a variance analysis on project costs, the following issue was raised.

Two team members, Jade in Northern Ireland and Akani in Scotland, had independently completed issue logs identifying a power storage problem that would affect the current scope of the project.

Addressing the power storage problem would mean securing additional human and technological resources.

Jade and Akani both indicated that any amendment to the scope of the project would require an update to the project schedule, but neither could be certain whether the delay would be a matter of days or several weeks.

When awarding the project to Cumbrian Motors plc the Aeronautical Board had indicated that any delays would be unacceptable, as it would put at risk the completion of the project in time for its annual conference in January 2019.

2 Refer to Text 2.

(a) Outline how Kyren should deal with the issue raised by Jade and Akani.

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.....**[6]**

(b) Kyren conducts a variance analysis on project costs on a monthly basis.

Financial data for the project up to 17 September 2018 is shown in **Table 1**.

	Budgeted spend	**Spend to date**
Technological resources	£24 000 000	£30 000 000
Physical resources	£36 000 000	£30 600 000
Human resources	£5 000 000	£3 250 000

Table 1

(i) State **one** piece of forecasted data shown in Table 1.

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

(ii) Calculate the percentage variance for each of the following budgets.

In each case, state whether the variance is favourable or adverse.

Technological resources.....

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Physical resources .....

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Human resources.....

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[6]

(iii) Explain **one** benefit and **one** drawback to Kyren of conducting a variance analysis at monthly intervals throughout the project.

Benefit .....

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Drawback .....

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[4]

Turn over for the next question

Text 3

As project manager, Kyren had to process a large number of project monitoring reports.

On Friday 30th November 2018, Kyren received the latest results from product testing.

He was pleased to read that the power storage problem appeared to have been solved by the use of new battery technology. However, he was alarmed to read that the latest prototype of the DC electric aircraft motor the company was developing had failed product testing.

The latest design of the aircraft motor, whilst working well in the laboratory, overheated on its test flight. With the Aeronautical Board's 2019 annual conference only a few weeks away, an urgent reactive adjustment to the design of the aircraft motor was required.

To work on a solution to the problem, Kyren called an emergency face-to-face meeting on Sunday 2nd December at the main production site in England, with all members of the project team - the two team leaders and all 30 other members. The team members were given less than 48 hours' notice of the meeting and everyone was expected to attend. Cumbrian Motors plc's employees do not normally work on Sundays, and some already had family commitments.

3 Refer to Text 3.

(a) Kyren called an emergency face-to-face meeting.

Evaluate the advantages and disadvantages to the outcome of the project of calling this meeting.

[12]

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(b) Explain why a good project manager should insist on receiving monitoring reports on a frequent basis.

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

(c) Kyren called the emergency team meeting to develop the reactive adjustment required to the design of the aircraft motor.

Explain what is meant by 'reactive adjustment'.

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.....**[2]**

Text 4

A solution to the aircraft motor overheating was found.

After an extremely busy final two weeks, Kyren eventually obtained acceptance from the project sponsor that the project deliverables had been achieved.

With time creep of just five days, the project was completed in time for the Aeronautical Board's 2019 annual conference.

The media coverage of the conference and of the project delivered by Cumbrian Motors plc was extensive and extremely positive. Kyren used the positive media coverage to emphasise the success of the project in the final project report.

Kyren has also issued questionnaires to the two project team leaders and each of the 30 team members to gain further subjective feedback on his own personal performance.

4 Refer to Text 4.

(a) In the table below, identify with a tick (✓) the type of feedback provided by each of the sources used by Kyren.

You should only draw **two** ticks.

Feedback	Formal	Informal
Media coverage		
Questionnaires		

[2]

(b) (i) Explain what is meant by the term 'subjective feedback'.

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.....**[2]**

(ii) Outline **three** project completion measures Kyren could use to support the subjective feedback.

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[6]

(c) The feedback that Kyren receives on his personal performance suggests that he has good delegation skills.

(i) State what is meant by the term ‘personal performance'.

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

(ii) Explain **one** benefit of Kyren's good delegation skills to each of the following:

Kyren .....

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Project team leaders .....

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Cumbrian Motors plc .....

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[6]

(d) Describe **three** ways Kyren could improve his critical thinking skills.

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[6]

END OF QUESTION PAPER

ADDITIONAL ANSWER SPACE

If additional answer space is required, you should use the following lined page(s). The question number(s) must be clearly shown – for example 1(d) or 4(b)(i).