

**Cambridge Technicals  
Engineering**

**Unit 24: Project management in engineering**

Level 3 Cambridge Technical Certificate/Diploma in Engineering  
**05822 - 05825**

**Mark Scheme for January 2019**

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

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**Annotations**

<b>Annotation</b>	<b>Meaning</b>
Tick	Valid point, mark awarded
Cross	Incorrect
Question mark	Response unclear
BOD	Benefit of doubt (mark awarded)
TV	Too vague (mark not awarded)
REP	Repetition (no additional marks awarded)
NAQ	Not answered question (incorrect focus)
L1	Level 1 response (identification)
L2	Level 2 response (explanation)
L3	Level 3 response (analysis)
L4	Level 4 response (evaluation)
CONT	Context (required for high L4 award only)

**Subject specific marking instructions**

For Level of Response marked questions marked over 4 levels, the candidate can access at L1 or L2. In either case, they can analyse the point made and proceed directly to L3.

L3 analysis is required before L4 can be accessed.

Question			Answer	Marks	Guidance
1	(a)	(i)	Indicative content:  <ul style="list-style-type: none"> <li>project proposal.</li> </ul>	1	For one mark.
1	(a)	(ii)	Responses may include: <ul style="list-style-type: none"> <li>formalises the communication routes that will be used</li> <li>sets out the reporting requirements</li> <li>shows what information will be shared</li> <li>outlines when, how and with whom communication should take place throughout the project.</li> </ul>	1	One mark for a correct identification.
1	(b)	(i)	Indicative content:  Node 3: EST <b>20</b> , LFT <b>20</b> Node 4: EST <b>27</b> , LFT <b>27</b> Node 6: EST <b>43</b> , LFT <b>43</b>	6	One mark for each correct figure, to a maximum of six marks.
1	(b)	(ii)	Indicative content:  31 days – 2 days - 24 days = <b>5 days</b>	1	For one mark.  Units i.e. ‘days’ required to award the mark.
1	(b)	(iii)	Indicative content:  The critical activities (those on the longest route) are: <b>A, B, C, G, H, E.</b>  By name: Outline plan, Stakeholder analysis, Risk analysis, Quality plan, Project schedule, Financial Plan.	1	For one mark.  All six required for award of the mark (tasks can be in any order).  Accept tasks labelled alphabetically or named.
1	(b)	(iv)	Indicative content:  51 days – 48 days = <b>3 days</b>	1	For one mark.  Units i.e. ‘days’ required to award the mark.

Question			Answer	Marks	Guidance
1	(c)	(i)	<p>Responses may include:</p> <ul style="list-style-type: none"> <li>• quality targets</li> <li>• quality standards</li> <li>• quality control methods</li> <li>• quality assurance activities</li> <li>• quality roles and responsibilities</li> <li>• procedure for reporting quality issues.</li> </ul>	1	<p>One mark for a correct identification of an item.</p> <p>Accept specific or generic responses.</p>
1	(c)	(ii)	<p>Responses may include:</p> <ul style="list-style-type: none"> <li>• more likely to complete on time</li> <li>• more likely to be successful</li> <li>• more likely to complete to budget</li> <li>• more likely to meet its deliverables</li> <li>• more likely to identify problems at an early stage</li> <li>• will be better organised</li> <li>• more efficient.</li> </ul> <p>Exemplar responses:</p> <p>e.g. The projects deliverables are more likely to be met (1) because any problems will be identified and dealt with quickly (1).</p> <p>e.g. The project will be well organised (1) and, therefore, more likely to be completed in time for the annual conference (1).</p>	2	<p>One mark for a benefit to project sponsors, plus one further mark for explanation.</p> <p>Benefit must be relevant to the project sponsor.</p> <p>Explanation mark can be awarded for explaining either the cause or consequence of the benefit.</p>

Question		Answer	Marks	Guidance
1	(d)	<p>Indicative content:</p> $E = \frac{O + 4M + P}{6}$ <p><math>O = 42</math> (50 - 16% of 50 i.e. <math>50 - 8 = 42</math>)</p> <p><math>M = 50</math> <math>4M = 200</math> (<math>4 \times 50</math>)</p> <p><math>P = 70</math> (50 + 40 of 50 i.e. <math>50 + 20 = 70</math>)</p> $E = \frac{42 \text{ (OFR)} + 200 \text{ (OFR)} + 70 \text{ (OFR)}}{6} = \frac{312}{6} = \mathbf{52 \text{ (OFR) weeks}}$	6	<p>Up to 6 marks.</p> <p>Award full marks (6 marks) for correct answer irrespective of working. Correct units required.</p> <p>1 mark for correct formula/method stated or applied.</p> <p>1 mark for each correct figure for O, M and P.</p> <p>1 mark for '52' (OFR), plus an additional one mark for 'weeks' (i.e. units only awardable if 52 is given as the answer).</p> <p>OFR applies to O, M and P and total '52'.</p> <p>Award 5 marks for an answer of '52' with incorrect units (or no units) given.</p>
1	(e)	<p>Responses may include:</p> <ul style="list-style-type: none"> <li>Political e.g. government initiatives, government grants, government policy, general election, political party in power, local government regulations.</li> <li>Environmental e.g. environmentalist pressure group activity, carbon emissions, global warming, air pollution, air quality, noise pollution, wastage, recycling.</li> <li>Technological e.g. emerging technology, clean fuel, bio fuel, battery technology, energy efficiency.</li> </ul>	3	<p>One mark for each correct identification, to a maximum of three marks.</p> <p>In each case, accept any relevant factor.</p>

Question		Answer	Marks	Guidance	
2	(a)	<p>Responses may include:</p> <ul style="list-style-type: none"> <li>• take issue seriously</li> <li>• investigate issue further</li> <li>• consult Jade/Akani for further details</li> <li>• discuss with project team leaders</li> <li>• gather consensus from rest of project team</li> <li>• ascertain likely length of delay</li> <li>• ascertain impact on budget requirements</li> <li>• obtain team support for intended course of action</li> <li>• negotiate for additional resources</li> <li>• inform/do not inform key stakeholders</li> <li>• re-scope/do not re-scope the project</li> <li>• alter/do not alter the schedule</li> <li>• amend/do not amend the project plan.</li> </ul> <p>Exemplar response:</p> <p>Kyren should contact Jade and Akani to discuss the issue each of them has raised (1). This will allow Kyren to find out more information (1). He should also raise the matter with the two project team leaders (1) in order to make a judgement on whether to re-scope the project or not (1). Assuming the consensus agrees with Jade and Akani, Kyren should re-scope the project (1) and key stakeholders must be informed (1).</p>	6	One mark for each valid point to a maximum of six such points, allow development.	
2	(b)	(i)	Indicative content:	1	One mark for a correct identification of an item.
			Budgeted spend on Technological (1) /Physical (1) /Human (1) resources.		<p>Accept answers given in numbers (pound signs not required):</p> <p><b>£24 000 000, £36 000 000 or £5 000 000</b> Or e.g. £5m for £5 000 000.</p>

Question			Answer	Marks	Guidance
2	(b)	(ii)	<p>Indicative content:</p> <p>Technological resources: <math>\frac{\pounds 6,000,000}{\pounds 24,000,000} \times 100 = \mathbf{25\% \text{ adverse}}</math></p> <p>Physical resources: <math>\frac{\pounds 5,400,000}{\pounds 36,000,000} \times 100 = \mathbf{15\% \text{ favourable}}</math></p> <p>Human resources: <math>\frac{\pounds 1,750,000}{\pounds 5,000,000} \times 100 = \mathbf{35\% \text{ favourable}}</math></p>	3 x 2	<p>One mark for each correct percentage, to a maximum of three marks.</p> <p>One mark for each correct variance indicator, to a maximum of three marks.</p> <p>Ignore minus signs e.g. accept '-15% favourable'.</p>
2	(b)	(iii)	<p>Responses may include:</p> <ul style="list-style-type: none"> <li>benefit e.g. close monitoring, early identification of issues, allows for swift intervention/rectification.</li> <li>drawback e.g. time, workload.</li> </ul> <p>Exemplar response:</p> <p>e.g. One benefit to Kyren of conducting a variance analysis on a monthly basis is that he can monitor the project spending pattern closely (1) and approach the funding organisation for further funding if needed (1).</p> <p>e.g. One drawback to Kyren of conducting a variance analysis on a monthly basis is that the process is time consuming (1). This will reduce the time he has available to oversee other aspects of the project and the time available to carry out his duties as Senior Manager for Research and Development (1).</p>	2 x 2	<p>In each case award:</p> <p>Award <b>two</b> marks for an explanation that addresses the benefit/drawback of doing a variance analysis frequently.</p> <p>Award <b>one</b> mark for an explanation that addresses the benefit/drawback of doing a variance analysis.</p> <p>Benefit/drawback must be to Kyren.</p>



Question		Answer	Marks	Guidance
3	(a)	<p>Use level of response criteria.</p> <p>Responses may include:</p> <p><u>Advantages</u></p> <ul style="list-style-type: none"> <li>• time saving</li> <li>• utilises all skills</li> <li>• enhances focus</li> <li>• effective brainstorming/problem-solving</li> <li>• clearer communication</li> <li>• faster communication</li> <li>• team building</li> <li>• improved project team identity/morale</li> <li>• does not leave anyone out/ avoids alienating specific team members</li> </ul> <p><u>Disadvantages</u></p> <ul style="list-style-type: none"> <li>• 33 attendees too large for decision-making</li> <li>• very little preparation time before the meeting</li> <li>• short notice for attendees</li> <li>• project team may already have personal commitments</li> <li>• employees may resent being called in at short notice</li> <li>• loss of project team goodwill</li> <li>• childcare provision may need to be made</li> <li>• team members may be distracted by childcare issues</li> <li>• human resource cost issues</li> <li>• location inconvenient for some attendees especially those based in the highlands of Scotland and Northern</li> </ul>	12	<p>Level of response:</p> <p>Level 4: 10-12 marks Candidate evaluates the advantages and disadvantages to the outcome of the project of Kyren's calling the emergency face-to-face meeting.</p> <p>Level 3: 7-9 marks Candidate analyses advantage(s)/disadvantage(s) to the outcome of the project of Kyren's calling the emergency face-to-face meeting.</p> <p>Level 2: 4-6 marks Candidate explains advantage(s)/disadvantage(s) of Kyren's calling the emergency face-to-face meeting.</p> <p>Level 1: 1-3 marks Candidate identifies advantage(s)/disadvantage(s) of Kyren's calling the emergency face-to-face meeting.</p> <p>L3 Analysis of impacts must be to the outcome of the project. Do not award L3 marks for impacts solely on employees, Kyren, the Project Sponsors or Cumbrian Motors plc.</p> <p>Do <b>not</b> award marks for simply repeating the scenario.</p>

Question	Answer	Marks	Guidance
	<ul style="list-style-type: none"> <li>• difficulty in making travel arrangements</li> <li>• overnight accommodation may be needed</li> <li>• cost of travel</li> <li>• cost of accommodation</li> <li>• critical nature of fault</li> <li>• what reactive adjustment to make is likely to take more than one day to decide</li> <li>• alternative methods could have been used.</li> </ul> <p>Exemplar response:</p> <p>e.g. One advantage of Kyren calling an emergency face-to-face meeting to solve the problem with the motor is that it gets the entire team involved (L1). This means that a wide range of ideas from a range of specialists can be considered (L2), making it more likely that the best way to fix the problem will be found (L3). It also allows decisions to be made quickly (L1) and should lead to the design adjustment being made in time for the annual conference (L3).</p> <p>However, having a face-to-face meeting is expensive (L1), not least because it requires the team leaders and each of their 10 team members to travel from the highlands of Scotland and Northern Ireland (L2). This will increase the project's spend on human resources (L3).</p> <p>The most crucial element is to redesign the motor so that it does not overheat at high altitude and this needs to be done so that it can be presented at the annual conference in January. For these reasons the advantages of specialised skills combined with a timely solution far outweigh the disadvantages of having a face to face meeting (L4). This appears to be especially true since the project appear to be well within budget for its human resource spend (L4).</p>		

Question		Answer	Marks	Guidance
3	(b)	<p>Responses may include:</p> <ul style="list-style-type: none"> <li>• to identify progress/lack of progress as soon as possible</li> <li>• to allow timely intervention</li> <li>• to bring the project back on track as quickly as possible</li> <li>• to minimise any deviation from the plan</li> <li>• to minimise costly delays</li> <li>• issues need to be identified before they can be addressed</li> <li>• early identification of issues</li> <li>• best to deal with problems as soon as they arise</li> <li>• so prompt diagnosis can be made</li> <li>• lengthy monitoring intervals may not spot an issue until it is too late</li> <li>• lengthy monitoring intervals may delay rectification</li> <li>• lengthy monitoring intervals are likely to mean the project veers further off track than it otherwise would</li> <li>• lengthy product monitoring may lead to less successful project outcomes.</li> </ul> <p>Exemplar response:</p> <p>e.g. Project delivery needs to be monitored frequently so that remedial action can be taken as soon as possible (1), minimising the cost (1) and keeping the project on track (1).</p>	3	<p>One mark for each correct point of explanation, to a maximum of three such points.</p> <p>No context required.</p>
3	(c)	<p>Responses may include:</p> <ul style="list-style-type: none"> <li>• (adjustment) e.g. change, alteration, amendment, improvement.</li> <li>• (reactive) e.g. in response to an event, acting after the event, the event controls the reaction, not proactive, not preventative.</li> </ul> <p>Exemplar response:</p> <p>e.g. Making an alteration (1) in response to a situation that has arisen (1).</p>	2	<p>One mark for explanation of 'adjustment'.</p> <p>One mark for explanation of 'reactive'.</p>

Question		Answer	Marks	Guidance
4	(a)	<p>Indicative content:</p> <p>Media coverage: Informal</p> <p>Questionnaires: Formal</p>	2	<p>One mark for media coverage. One mark for questionnaires.</p> <p>The 'Contradictory Responses' rule applies (see page 2) e.g. a candidate who ticks both 'formal' and 'informal' for media coverage would forfeit that mark.</p>
4	(b) (i)	<p>Responses may include:</p> <ul style="list-style-type: none"> <li>• feedback e.g. incoming comment/review/communication</li> <li>• subjective e.g. based on a person's opinion/not factual, influenced by feelings/tastes/thoughts, requires interpretation/analysis.</li> </ul> <p>Exemplar response</p> <p>e.g. Response (1) based on opinion (1).</p>	2	<p>One mark for meaning of 'feedback'. One mark for meaning of 'subjective'.</p>
4	(b) (ii)	<p>Responses may include:</p> <ul style="list-style-type: none"> <li>• time</li> <li>• cost</li> <li>• deliverables</li> <li>• scope</li> <li>• acceptance by stakeholders</li> <li>• number of complaints.</li> </ul> <p>Exemplar responses:</p> <p>e.g. Kyren could state the total cost of the project (1) to show whether the project overspent (1).</p> <p>e.g. The final project report should detail the project deliverables (1) i.e. the tangible output of the project (1).</p>	3 x 2	<p>One mark for each correct identification to a maximum of three identifications, plus one further mark for each of three developments.</p> <p>Criteria explicitly required to award the identification mark.</p> <p>Development mark can be awarded for explanation or description.</p>

Question			Answer	Marks	Guidance
4	(c)	(i)	<p>Responses may include:</p> <ul style="list-style-type: none"> <li>the way someone carries out tasks</li> <li>the way an individual behaves</li> <li>how well an individual has gone about their tasks</li> <li>own strengths and weaknesses</li> <li>own achievements and shortcomings.</li> </ul>	1	<p>One mark for a correct identification.</p> <p>Do not award 'performed' as an explanation of 'performance'.</p>
4	(c)	(ii)	<p>Responses may include:</p> <ul style="list-style-type: none"> <li>to Kyren e.g. less stress, reduced workload, greater focus, freeing up time, less tired, improved work-life balance, career development.</li> <li>to Project team leaders e.g. develop new skills, career development, increased promotion prospects, job satisfaction, empowerment.</li> <li>to Cumbrian Motors plc e.g. increased efficiency, R&amp;D department managed effectively, stay at the forefront of innovation, reduced costs, increased profits, higher share price, enhanced reputation.</li> </ul> <p>Exemplar responses:</p> <p>e.g. One benefit to Kyren is that he may be less stressed (1).</p> <p>e.g. One benefit to Kyren is that he may be less stressed when dealing with problems such as the overheating motor (2).</p> <p>e.g. One benefit to project team leaders is that they can develop their project management skills (1).</p> <p>e.g. One benefit to project team leaders is that they can develop their project management skills in the transport industry (2).</p> <p>e.g. One benefit to the company is that the Research and Development Department will be well managed (1).</p>	3 x 2	<p>In each case award:</p> <p><b>Two</b> marks for a contextual benefit. <b>One</b> mark for a non-contextual benefit.</p> <p>Explanation mark can be awarded for explaining either the cause or consequence of the benefit.</p>

Question			Answer	Marks	Guidance
			e.g. One benefit to the company is that the Research and Development Department will be well managed, completing with only 5 days of time creep (2).		
4	(d)		<p>Responses may include:</p> <ul style="list-style-type: none"> <li>• go on a training course</li> <li>• read relevant books</li> <li>• use a self-help guide</li> <li>• follow an online tutorial</li> <li>• get help from a mentor</li> <li>• be aware of personal bias</li> <li>• explore other points of view</li> <li>• question assumptions.</li> </ul> <p>Exemplar response:</p> <p>e.g. Kyren could do an online training course (1) which teaches him to use evidence, rather than personal bias, to reach conclusions (1).</p>	3 x 2	One mark for each correct identification to a maximum of three identifications, plus one further mark for each of three descriptions.

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