

# **Cambridge Technicals Engineering**

## **Unit 24: Project management for engineers**

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

## **Mark Scheme for January 2020**

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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.

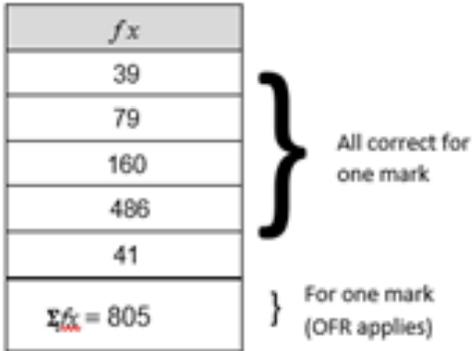
L3 analysis is required before L4 can be accessed.

Question		Answer	Marks	Guidance																				
1	(a)	<p>Indicative content:</p> <table border="1"> <thead> <tr> <th></th> <th colspan="4">Section</th> </tr> <tr> <th></th> <th>Project proposal</th> <th>Feasibility study</th> <th>Project controls</th> <th>Communication strategy</th> </tr> </thead> <tbody> <tr> <td><b>How and when information is to be shared</b></td> <td></td> <td></td> <td></td> <td>✓</td> </tr> <tr> <td><b>The financial justification for the project</b></td> <td></td> <td>✓</td> <td></td> <td></td> </tr> </tbody> </table>		Section					Project proposal	Feasibility study	Project controls	Communication strategy	<b>How and when information is to be shared</b>				✓	<b>The financial justification for the project</b>		✓			2	<p>One mark for each correct identification, to a maximum of two identifications.</p> <p>Contradictory response rule applies to each row of the grid (see preamble item 5) e.g. two ticks in the same row, scores 0 for that row.</p>
	Section																							
	Project proposal	Feasibility study	Project controls	Communication strategy																				
<b>How and when information is to be shared</b>				✓																				
<b>The financial justification for the project</b>		✓																						
1	(b)	<p>Indicative content:</p> <ul style="list-style-type: none"> <li>• purpose</li> <li>• aims</li> <li>• objectives</li> <li>• scope</li> <li>• constraints</li> <li>• deliverables</li> <li>• targets</li> <li>• communication</li> <li>• controls.</li> </ul>	3	<p>One mark for each correct identification, to a maximum of three identifications.</p>																				

Question		Answer	Marks	Guidance
1	(c)	<p>Indicative content:</p> <ul style="list-style-type: none"> <li>• Chief Executive Officer (CEO)</li> <li>• directors</li> <li>• senior management</li> <li>• managers</li> <li>• (research/industrial engineers</li> <li>• Director of Research and Development</li> <li>• Aftersales Manager</li> <li>• Public Relations Manager</li> <li>• Floor Manager</li> <li>• Senior Defects Engineer</li> <li>• Project manager</li> <li>• Project team leaders</li> <li>• Project team members</li> <li>• Anvi Bulara</li> <li>• Si Dylan</li> <li>• Faz Maan.</li> </ul>	2	<p>One mark for each correct identification, to a maximum of three identifications.</p> <p>Accept names, job roles, job titles or project management roles.</p> <p>Do <b>not</b> award repeat answers e.g. 'Anvi Bulsara' and 'Project Manager' are the same stakeholder – one mark.</p> <p>Do <b>not</b> award project board/steering committee.</p>

Question		Answer	Marks	Guidance
1	(d)	<p>Use level of response criteria.</p> <p>A directive leadership style uses goal-path theory. The manager sets the objectives and communicates these clearly with their subordinates, together with clear direction on what should be done and how this should be achieved.</p> <p>Responses may include:</p> <ul style="list-style-type: none"> <li>• advantages <ul style="list-style-type: none"> <li>○ clearly defined objectives</li> <li>○ clear directions</li> <li>○ precise instructions</li> <li>○ tends to get fast results</li> <li>○ tight control</li> <li>○ actively managed</li> <li>○ clear lines of authority/responsibility</li> <li>○ Anvi's preferred style</li> </ul> </li> <li>• disadvantages <ul style="list-style-type: none"> <li>○ less empowering</li> <li>○ less motivating</li> <li>○ may insult those with expertise</li> <li>○ may not engender team work</li> <li>○ may limit co-operation levels</li> <li>○ may stifle expert/creative input.</li> </ul> </li> </ul> <p>Exemplar response:  Directive leadership works well when time is at a premium (L1) because orders are clearly dictated (L2). This helps ensure that everyone can get on with their tasks quickly, minimising the time it takes to investigate the increased level of complaints (L3). However, one disadvantage of using a directive leadership style is that it fails to obtain ideas from other members of the project team (L1), especially the designated team leaders who both have considerable engineering expertise (L2). This could mean that</p>	12	<p>Level of response:</p> <p>Level 4: 10-12 marks  Candidate evaluates the advantage(s) and disadvantages(s) to Cetus plc of Anvi using a directive leadership style to manage the project.</p> <p>Level 3: 7-9 marks  Candidate analyses advantage(s)/disadvantage(s) to Cetus plc of Anvi using a directive leadership style to manage this project.</p> <p>Level 2: 4-6 marks  Candidate explains advantage(s)/disadvantage(s) to Cetus plc of Anvi using a directive leadership style to manage this project.</p> <p>Level 1: 1-3 marks  Candidate identifies advantage(s)/ disadvantage(s) to Cetus plc of Anvi using a directive leadership style to manage this project.</p> <p>L1 .Accept beneficial features as advantages. Accept non-beneficial features as disadvantages.</p> <p>L2 Any development.</p> <p>L3 Impact of L1 on the business. Accept impacts on the project.  Project more or less successful only awardable at L3 if a reason is given.</p> <p>Award 10 marks for a justified overall judgement with no context.</p> <p>Award 11 marks for a justified overall judgement which mentions context.</p>

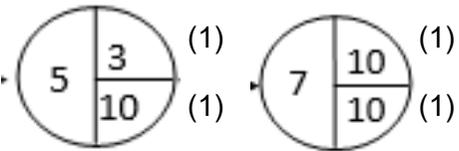
Question			Answer	Marks	Guidance		
			<p>intelligent ideas are overlooked, reducing the likely successes of the project (L3).</p> <p>Given that both of Anvi's team leaders are experts and have been project managers themselves (CONT), it may be unwise to use a directive approach which at best may reduce their commitment levels and at worst may stifle their input in the project. Anvi is new to project management and needs all the support that she can get. A more collaborative leadership style might be more advantageous (L4).</p>		Award 12 marks for a detailed justified overall contextual judgement which uses context.		
2	(a)	(i)	<p>Indicative content:</p> <table border="1"> <tr> <td style="text-align: center;">Actual</td> <td style="text-align: center;">Forecasted</td> </tr> </table>	Actual	Forecasted	1	<p>One mark for the correct identification.</p> <p>Contradictory response rule applies (see preamble item 5) e.g. both items circled in the scores 0.</p>
Actual	Forecasted						
2	(a)	(ii)	<p>Indicative content:</p> <table border="1"> <tr> <td style="text-align: center;">Internal</td> <td style="text-align: center;">External</td> </tr> </table>	Internal	External	1	<p>One mark for the correct identification.</p> <p>Contradictory response rule applies (see preamble item 5) e.g. both items circled in the scores 0.</p>
Internal	External						

Question			Answer	Marks	Guidance
2	(b)	(i)	Indicative content: 	2	Up to two marks. One mark for 39, 79, 160, 486, 41 all correct. One mark for sum = 805 (OFR applies)
2	(b)	(ii)	Indicative content: $805 \text{ (OFR)}/500 = \mathbf{1.61}$ (OFR) mm	1	For one mark. Award '1.61'. Do <b>not</b> award 1.6 or 1.62. OFR applies.
2	(b)	(iii)	Indicative content: $25/500 \times 100 = \mathbf{5\%}$	1	For one mark. Award '5'.
2	(b)	(iv)	Responses include: <ul style="list-style-type: none"> <li>• Test: Battery cell thickness</li> <li>• Findings: E.g. Out of tolerance/Malfunctioning/Mean too high/some outside of control limits, 5% (OFR) outside control limits, etc.</li> <li>• Further action required: Yes</li> </ul>	3	Up to three marks One mark for details of test. One mark for details of findings. One mark for 'Yes'. Signature is <b>not</b> required on the form.

Question			Answer	Marks	Guidance
2	(b)	(v)	<p>Use level of response criteria.</p> <p>Responses include:</p> <ul style="list-style-type: none"> <li>• reduced validity/invalidate test results/compromise results</li> <li>• all recorded results could be 0.1mm larger or smaller than stated</li> <li>• a higher percentage of battery cells out of the control limits</li> <li>• more battery cells could be over the maximum control limit</li> <li>• some battery cells could be under the minimum control limit</li> <li>• results recorded as 1.62mm could actually measure 1.63mm</li> <li>• results recorded as 1.56mm could actually measure 1.55mm</li> </ul> <p>Exemplar responses:</p> <p>If the micrometer is found to be only accurate to 0.1mm then the validity of the findings are compromised, potentially meaning far more than 5% of the battery cells produced are beyond the maximum control limit (L1).</p> <p>Battery cells recorded as measuring 1.62mm could actually be 1.63mm, which means that the problem could be greater than first thought as more battery cells could be over the maximum control limit (L2).</p>	4	<p><b>L2 3 - 4</b> Candidate gives an explanation which refers to the data in Table 1.</p> <p><b>L1 1 - 2</b> Candidate gives a generic explanation relating to how the validity of data is affected by the accuracy of measurement.</p> <p>Award the bottom of the appropriate mark band if one valid point is made.</p> <p>Award the top of the appropriate mark band for a developed answer i.e. if two or more points made, or one point developed.</p> <p>L2 must use the data in Table 1. Do <b>not</b> award for references to 0.01 or 5% (OFR).</p>

Question			Answer	Marks	Guidance
2	(c)	(i)	<p>Indicative content:</p> <ul style="list-style-type: none"> <li>• debt finance involves borrowing</li> <li>• debt funding has to be paid back</li> <li>• debt finance is obtained from bankers/financier</li> <li>• equity finance is capital raised by selling shares</li> <li>• equity funding requires a return on investment</li> <li>• equity funding is financed from owners/shareholders.</li> </ul> <p>Exemplar response:</p> <p>Debt funding uses money lent to the business (1) whereas equity funding uses additional capital money from investors (1).</p>	2	<p>One mark for debt finance. One mark for equity finance.</p> <p>To award full marks the difference must be, at least, implied.</p> <p>No context required.</p>
2	(c)	(ii)	<p>Indicative content:</p> <ul style="list-style-type: none"> <li>• advantages: long term, pay in instalments, easy to budget, current shareholder stakes retained, project control retained.</li> <li>• disadvantages: has to be repaid, interest charged, rates may increase, additional monthly cash outflow, negative effect on net cash flow, increased budget spend, negative impact on profit, increased risk, penalties for late payment.</li> </ul> <p>Exemplar response:</p> <p>One advantage of using a bank loan is that payments are made in instalments (1) because they can be spread over a long period of time (1) minimising the impact on the budget of having to buy a replacement machine (1).</p> <p>One disadvantage of using a bank loan is that it incurs interest charges (1). Borrowing enough money to buy such an expensive machine will significantly increase finance costs (1). This increases the budget spend on the project (1).</p>	6 2 x 3	<p>One mark for an advantage, plus one mark for explanation and a further one mark for analysis. AND One mark for a disadvantage, plus one mark for explanation and a further one mark for analysis.</p> <p>In each case, the third mark must be analytical (rather than just more explanation).</p>

Question		Answer	Marks	Guidance	
3	(a)	<p>Responses include:</p> <ul style="list-style-type: none"> <li>managing tension within the project team e.g. should be able to pull the team together, conflict mitigation, reduced risk of breach of confidentiality, reduce risk of damaging corporate reputation, improved motivation, better outcomes, lower frustration levels, limit blame allocation.</li> <li>dealing with tension between external stakeholders e.g. should be able to stop the issue escalating further, minimise conflict with powerful stakeholders, reduce the risk of losing orders.</li> </ul> <p>Exemplar responses:</p> <p>Anvi's excellent conflict management skills when managing tension within the project team are essential because they will calm down the team (1), helping them to solve the tablet (CONT (1)) charging fault as soon as possible (1).</p> <p>Anvi's excellent conflict management skills are also important when dealing with the brand leaders. This is because it can help reduce their concerns about Cetus plc (1), minimising any issue of penalties against the company (1) for the faulty manufacture of the batteries (CONT (0)).</p>	<p><b>6</b> <b>2 x 3</b></p>	<p>In each case: One mark for why important. One mark for benefit.</p> <p>Plus one mark for context.</p>	
3	(b)	(i)	Indicative content:	<p><math>\frac{\pounds 1.2 \text{ million}}{113 \text{ million battery cells}} = 1.06\text{p}</math></p>	<p><b>2</b></p> <p>Up to two marks.</p> <p>Award full marks for 1.06, rounded from Units (p) and 2 decimal places required for 2 marks.</p> <p>Award one mark for a power of ten error, insufficient decimal places.</p>

Question			Answer	Marks	Guidance
3	(b)	(ii)	Responses include: <ul style="list-style-type: none"> <li>• replacement machines are expensive</li> <li>• new machines would take the project over budget</li> <li>• requires additional finance</li> <li>• requires authorisation to purchase</li> <li>• critical financing decision</li> <li>• decision to purchase beyond Anvi's remit (financial constraint).</li> </ul>	1	One mark for a correct identification.
3	(c)	(i)	Indicative content:  <b>Activity C = 8 (1)</b>	5	Up to five marks.
3	(c)	(ii)	Indicative content: 16 weeks	1	For one mark. Units required (accept equivalents).
3	(c)	(iii)	Indicative content: $1+8+1+2 = 12$ weeks $12 \text{ weeks} < 13 \text{ weeks} \therefore 0$ .	1	For one mark. Accept variants e.g. 'zero', 'none', 'it won't.', 'no extra weeks', 'no change' etc.

Question			Answer	Marks	Guidance
3	(c)	(iv)	<p>Indicative content:</p> <p>A C E G J K</p> <p>or</p> <p>Orders communicated to both suppliers; Lead time for supply of new VOVP; Delivery and unloading of new VOVP; Installation of new VOVP; On-site briefing and training; Test production.</p>	1	<p>For one mark.</p> <p><b>All</b> correct for one mark.</p> <p>Do <b>not</b> award if additional activities are suggested or activities are omitted.</p>
3	(d)		<p>Responses include:</p> <ul style="list-style-type: none"> <li>• lack of co-ordination of activities</li> <li>• poor planning</li> <li>• no contingencies</li> <li>• poor resource utilisation</li> <li>• resources not available or available at the wrong time</li> <li>• tasks done in the wrong order</li> <li>• further delays and time wasting</li> <li>• creation of bottle necks</li> <li>• confusion over when tasks are to be done</li> <li>• arguments within the project team</li> <li>• poor communication with external stakeholders.</li> </ul> <p>Exemplar response:</p> <p>Failing to update the schedule could lead to poor resource utilisation (1). For example, the installer of LL may turn up before the LL has been delivered (CONT)(1). At the very least, the installer is likely to charge a call-out fee, increasing the costs of the project (1).</p>	<p>6</p> <p>2 x 3</p>	<p>In each case:</p> <p>One mark for identification;</p> <p>One mark for explanation;</p> <p>Plus one mark for use of context.</p>

Question			Answer	Marks	Guidance
4	(a)	(i)	<p>Responses include:</p> <ul style="list-style-type: none"> <li>• lower/poorer quality</li> </ul>	1	<p>One mark for a correct identification.</p> <p>Concept of a reduction in quality required.</p> <p>Do not award examples.</p> <p>No context required</p>
4	(a)	(ii)	<p>Responses include:</p> <ul style="list-style-type: none"> <li>• inflation</li> <li>• interest rates (increased)</li> <li>• exchange rates (unfavourable).</li> </ul> <p>Exemplar response:</p> <p>One economic factor which might have caused the project to overspend is inflation (1). Inflation is a general increase in prices (1).</p>	4 2 x 2	<p>One mark for a correct identification up to a maximum of two identifications, plus one further mark for each of two descriptions.</p> <p>Do not award 'state of the economy'/'recession'.</p> <p>Do <b>not</b> award employment/ unemployment.</p>
4	(a)	(iii)	<p>Responses may include:</p> <ul style="list-style-type: none"> <li>• issue logs</li> <li>• complaints analysis</li> <li>• benchmarking.</li> </ul>	2	<p>One mark for a correct identification, to a maximum of two identifications.</p> <p>Do not award 'completion figures' e.g. deliverables, scope, time, cost, acceptance as these are excluded by the question.</p>

Question			Answer	Marks	Guidance
4	(a)	(iv)	<p>Responses may include:</p> <ul style="list-style-type: none"> <li>• to learn from mistakes</li> <li>• to inform future projects</li> <li>• to drive business improvement</li> <li>• to develop expertise</li> <li>• for training purposes</li> <li>• to amend documentation</li> <li>• to improve procedures.</li> </ul> <p>Exemplar response:</p> <p>e.g. It is important to recognise project failures so that lessons can be learnt (1). This should improve the outcomes of future projects undertaken (1).</p>	<p><b>4</b></p> <p><b>2 x 2</b></p>	<p>One mark for a correct identification up to a maximum of two identifications, plus one further mark for each of two explanations.</p> <p>No context required.</p> <p>Do <b>not</b> award self-evaluation.</p>
4	(b)	(i)	<p>Responses include:</p> <ul style="list-style-type: none"> <li>• understand the purpose and objectives of the project</li> <li>• maintain confidentiality</li> <li>• ensure a correct balance between project and non-project work</li> <li>• work to timescales</li> <li>• work within cost constraints</li> <li>• report progress</li> <li>• identify issues/complete issue logs</li> <li>• communicate with team leader</li> <li>• produce the deliverables to agreed standards</li> <li>• work together as a team</li> <li>• contribute to successful communication.</li> </ul>	<p><b>2</b></p>	<p>Award two marks for a contextual explanation (annotate ✓✓ CONT)</p> <p>Award one mark for a non-contextual explanation (annotate ✓).</p>

Question	Answer	Marks	Guidance
	<p>Exemplar responses:</p> <p>A key responsibility of a team member on this project is to work to agreed time scales so that the issue with the faulty battery packs (CONT) does not escalate (2).</p> <p>A key responsibility of a team member on this project is to work to agreed time scales so that any issues can be resolved quickly (1).</p>		

Question			Answer	Marks	Guidance
4	(b)	(ii)	<p>Responses include:</p> <ul style="list-style-type: none"> <li>• to find out what they are good out</li> <li>• to gain an insight into positive perceptions of others</li> <li>• to build on the strengths identified</li> <li>• to improve self-esteem</li> <li>• to improve morale/motivation</li> <li>• to apply for promotion</li> <li>• to gain employment elsewhere</li> <li>• to gain evidence of competence for project team leader roles.</li> </ul> <p>Exemplar response:</p> <p>Receiving detailed feedback on own strengths gives a team member information about what they are good at (1) which they could use in their CV when applying for another job (1).</p>	<p><b>4</b> <b>2 x 2</b></p>	<p>One mark for a correct identification up to a maximum of two identifications, plus one further mark for each of two explanations.</p> <p>Answer must relate to the strengths of team members (rather than weaknesses).</p>

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