

# Cambridge Technicals Engineering

# Unit 24: Project management for engineers

Level 3 Cambridge Technical Certificate/Diploma in Engineering 05873

# Mark Scheme for January 2024

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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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## MARKING INSTRUCTIONS

#### **PREPARATION FOR MARKING**

#### **RM ASSESSOR**

- 1. Make sure that you have accessed and completed the relevant training packages for on-screen marking: *RM Assessor Assessor Online Training*; *OCR Essential Guide to Marking*.
- 2. Make sure that you have read and understood the mark scheme and the question paper for this unit. These are posted on the RM Cambridge Assessment Support Portal <u>http://www.rm.com/support/ca</u>
- 3. Log-in to RM Assessor and mark the **required number** of practice responses ("scripts") and the **number of required** standardisation responses.

YOU MUST MARK 10 PRACTICE AND 10 STANDARDISATION RESPONSES BEFORE YOU CAN BE APPROVED TO MARK LIVE SCRIPTS.

#### MARKING

- 1. Mark strictly to the mark scheme.
- 2. Marks awarded must relate directly to the marking criteria.
- 3. The schedule of dates is very important. It is essential that you meet the RM Assessor 50% and 100% (traditional 40% Batch 1 and 100% Batch 2) deadlines. If you experience problems, you must contact your Team Leader (Supervisor) without delay.
- 4. If you are in any doubt about applying the mark scheme, consult your Team Leader by telephone or the RM Assessor messaging system, or by email

### 5. Crossed Out Responses

Where a candidate has crossed out a response and provided a clear alternative then the crossed out response is not marked. Where no alternative response has been provided, examiners may give candidates the benefit of the doubt and mark the crossed out response where legible.

### **Multiple Choice Question Responses**

When a multiple choice question has only a single, correct response and a candidate provides two responses (even if one of these responses is correct), then no mark should be awarded (as it is not possible to determine which was the first response selected by the candidate). When a question requires candidates to select more than one option/multiple options, then local marking arrangements need to ensure consistency of approach.

#### **Contradictory Responses**

When a candidate provides contradictory responses, then no mark should be awarded, even if one of the answers is correct.

#### Short Answer Questions (requiring only a list by way of a response, usually worth only one mark per response)

Where candidates are required to provide a set number of short answer responses then only the set number of responses should be marked. The response space should be marked from left to right on each line and then line by line until the required number of responses have been considered. The remaining responses should not then be marked. Examiners will have to apply judgement as to whether a 'second response' on a line is a development of the 'first response', rather than a separate, discrete response. (The underlying assumption is that the candidate is attempting to hedge their bets and therefore getting undue benefit rather than engaging with the question and giving the most relevant/correct responses.)

### Short Answer Questions (requiring a more developed response, worth two or more marks)

If the candidates are required to provide a description of, say, three items or factors and four items or factors are provided, then mark on a similar basis – that is downwards (as it is unlikely in this situation that a candidate will provide more than one response in each section of the response space.)

### Longer Answer Questions (requiring a developed response)

Where candidates have provided two (or more) responses to a medium or high tariff question which only required a single (developed) response and not crossed out the first response, then only the first response should be marked. Examiners will need to apply professional judgement as to whether the second (or a subsequent) response is a 'new start' or simply a poorly expressed continuation of the first response.

- 6. Always check the pages (and additional objects if present) at the end of the response in case any answers have been continued there. If the candidate has continued an answer there then add an annotation to confirm that the work has been seen.
- 7. Award NR (No Response) if:
  - if there is nothing written at all in the answer space
  - OR if there is a comment which does not in any way relate to the question (e.g. 'can't do', 'don't know')
  - OR if there is a mark (e.g. a dash, a question mark) which isn't an attempt at the question

Note: Award 0 marks - for an attempt that earns no credit (including copying out the question)

Team Leaders must confirm the correct use of the NR button with their markers before live marking commences and should check this when reviewing scripts.

8. The RM Assessor **comments box** is used by your team leader to explain the marking of the practice responses. Please refer to these comments when checking your practice responses. **Do not use the comments box for any other reason.** If you have any questions or comments for your team leader, use the phone, the RM Assessor messaging system, or e-mail.

- 9. Assistant Examiners will email a brief report on the performance of candidates to your Team Leader (Supervisor) by the end of the marking period. Your report should contain notes on particular strength displayed as well as common errors or weaknesses. Constructive criticism of the question paper/mark scheme is also appreciated.
- 10. For answers marked by levels of response:
  - a. To determine the level start at the highest level and work down until you reach the level that matches the answer
  - b. To determine the mark within the level, consider the following:

Descriptor	Award mark
On the borderline of this level and the one	At bottom of level
below	
Just enough achievement on balance for this level	Above bottom and either below middle or at middle of level (depending on number of marks available)
Meets the criteria but with some slight inconsistency	Above middle and either below top of level or at middle of level (depending on number of marks available)
Consistently meets the criteria for this level	At top of level

## 11. Annotations

Annotation	Meaning
$\checkmark$	Valid point, mark awarded
×	Incorrect
?	Response unclear
BOD	Benefit of doubt (mark awarded)
TV	Too vague (mark not awarded)
REP	Repetition (no additional marks awarded)
LI	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)
BP	Blank page
SEEN	Noted but no credit given
OFR	Own figure rule

## 12. Subject-specific marking instructions

L3 analysis is required before L4 can be accessed.

C	Ques	tion		Answer						Guidance
1	(a)		Indicative conte	ent:					4	One mark for each correct identification.
				Project initiation	Project planning	Project implementation	Project closure			Contradictory response rule applies (see preamble item 5) i.e. if more than one item in a row is ticked, award zero for that row.
			Identify project control strategies	$\checkmark$				(1)		award zero for that row.
			Monitor project quality			$\checkmark$		(1)		
			Recognise project successes and failures				$\checkmark$	(1)		
			Provide frequent updates regarding project execution			✓		(1)		
								-		

(	Question	Answer	Marks	Guidance
1	(b)	Indicative content: • purpose • aims • objectives • scope • constraints • deliverables • targets/goals • communication strategies • controls. Exemplar response: The outline plan should include project constraints (1). These are the restrictions or resource limitations that the project must operate under (1).	6 (2 x 3)	One mark for a correct identification up to a maximum of three identifications, plus one further mark for each of three developments. <b>NB</b> For the second mark a description of the meaning of the terms is required (rather than explanation of why). Do <b>no</b> t award examples.
1	(c)	Indicative content: The information comes from a trusted source (1) (1) (2) (2) (Reliability (1) (2) (1) (3) (1) (3) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1	3	One mark for each correct identification. Contradictory response rule applies (see preamble item 5) i.e. if two lines are drawn from a criterion, award zero for that criterion.

Question	Answer	Marks	Guidance
1 (d)	<ul> <li>Responses include:</li> <li>physical resources e.g. premises, facilities, materials, etc.</li> <li>technological resources e.g. computers, communication, etc.</li> <li>human resources e.g. availability, skills, training, etc.</li> <li>Exemplar responses:</li> <li>Physical resources: Charlie should identify alternative suppliers of required materials in advance (1) to minimise any delay in obtaining materials in the event that the initial supplier cannot supply (1).</li> <li>Technological resources: Charlie should install remote meeting software (1) in case a physical meeting cannot be scheduled (1).</li> <li>Human resources: Charlie should identify in advance who could take the place of a key project member (1) in the event that the member of staff was off work on long term sick (1).</li> </ul>	6 (3 x 2)	One mark for a correct identification up to a maximum of three identifications, plus one further mark for each of three developments. Responses must be proactive.

	Question		Answer	Marks	Guidance
1	(e)		<ul> <li>Responses include:</li> <li>Sara, the resource holder e.g. to increase the budget, to authorise spending, to check the feasibility of costings, etc.</li> <li>Ben, the project sponsor e.g. to renegotiate the scope of the project, to redefine aims and objectives, to approve changes, etc.</li> <li>Exemplar responses:</li> <li>Charlie may need to ask Sara to increase the budget for the project, so that he can implement the best carbon (CONT) reduction method (2)</li> <li>Charlie may need to ask Ben to increase the scope of the project (1).</li> </ul>	4 (2 x 2)	In each case, award: Two marks for a contextual reason. One mark for a non-contextual reason. For context look for: tyres, CO <sub>2</sub> , emissions, tractors, agriculture, aircraft, aeronautical, 10% profits, ethical, environmentally friendly, corporate social responsibility, carbon, etc.

(	Quest	tion	Answer	Marks	Guidance
2	(a)	(i)	<ul> <li>Indicative content:</li> <li>project manager-facing aspect of role e.g. to support, assist, obey, report to, liaise with the project manager.</li> <li>project team member-facing aspect of role e.g. to instruct, organise, co-ordinate, inform, keep on track, encourage, motivate, establish rapport, communicate with team members.</li> <li>Exemplar response: The role of a project team leader is to organise their allocated team (1) in such a way as to achieve specific tasks and duties as required by the project manager (1).</li> </ul>	2	One mark for project manager-facing aspect of role. And/or One mark for team member-facing aspect of the role. Do <b>not</b> award 'lead the team'.
2	(a)	(ii)	<ul> <li>Use level of response criteria. Responses include:</li> <li>use a collaborative/responsible/charismatic/visionary leadership style</li> <li>give them freedom/allow them to manager their team their way</li> <li>include in decision-making/problem-solving</li> <li>allow all team leaders to contribute to problem-solving</li> <li>listen to their concerns</li> <li>allow them to express viewpoints</li> <li>ask for advice/contributions</li> <li>use praise</li> <li>celebrate achievements</li> <li>team building exercises e.g. quizzes, survival games, escape room challenges</li> <li>organise social events e.g. meal out, attend a sporting event together, etc</li> </ul>	12	Level of response: Level 4: 10-12 marks Candidate evaluates ways Charlie could motivate his project team leaders. Level 3: 7-9 marks Candidate analyses way(s) Charlie could motivate his project team leaders. Level 2: 4-6 marks Candidate explains way(s) Charlie could motivate his project team leaders. Level 1: 1-3 marks Candidate identifies way(s) Charlie could motivate his project team leaders.

Question	Answer	Marks	Guidance
	<ul> <li>give (non-financial) rewards e.g. free lunch rewards</li> <li>set objectives/goals/targets for team leaders.</li> <li>Exemplar response:</li> <li>Charlie could motivate team leaders by using a collaborative leadership style (L1). This style of leadership would encourage the team leaders to use their own unique approaches to problem-solving (L2). This method may be especially motivating for Jane as it would show her that Charlie respects her innovative approach to problem-solving (L3).</li> <li>Charlie could also motivate his team leaders by allowing them to make some of the decisions (L1). This may prove especially useful for motivating Alex who believes he knows best and is annoyed by Charlie's appointment, because it will show that Charlie values his abilities and experience (L3).</li> <li>Charlie could also arrange for the four of them for go out for a meal (L1). This should help establish rapport (L2) and encourage them to work as a team. However, given that Leo works night shift, arranging a suitable time may prove difficult (L3).</li> </ul>		<ul> <li>Level 4:</li> <li>Award 10 marks for a justified overall judgement of which method is best, with no context.</li> <li>Award 11 marks for a justified overall judgement of which method is best, with contextual reference.</li> <li>Award 12 marks for a justified overall judgement of which method is best, with the use of context</li> <li>NB To access L4, at least three motivation methods must have been identified (one of which has been analysed).</li> <li>NB for L1 do not award vague answers – method required i.e. How. Do not award 'keep informed', 'socialise', 'make feel valued', 'establish rapport', 'be supportive', 'build close relationships', 'boost morale'. HOW required.</li> <li>NB L2 is for explanation of how the method works i.e. how it motivates (not for description of the method).</li> </ul>
	Given that Charlie is leading senior professionals with over 20 years of experience working for the company (CONT), I think that the most appropriate way to motivate the team leaders is by using a collaborative leadership style (L4). By showing that Charlie respects their contributions it should maximise all three team leaders' commitment to the project. It should also minimise any remaining resentment about Charlie being new to the company being assigned the role of project manager, leading to the best possible outcomes for the project (L4).		<ul> <li>NB L3 is for advantages/disadvantages of the method to the project/business. Do not award 'more motivated' or general advantages/disadvantages of motivating the workforce.</li> <li>Do not award 'meetings'/'frequent meetings'.</li> <li>Do not award payrises/bonuses or other financial rewards are these are not within the gift of the project manager.</li> </ul>

G	Question		Answer	Marks	Guidance
2	(b)	(i)	Phase	6 (2 x 3)	For each of the three phases B, C and D: One mark for correct start point and/or One mark for correct number of squares.
2	(b)	(ii)	<ul> <li>Indicative content:</li> <li>time creep/delay/fall behind/take longer</li> <li>budget overrun/increased costs</li> <li>quality erosion.</li> </ul> Exemplar responses: If Charlie fails to compare actual timings with the intended schedule, the project may overrun (1), because required adjustments have been overlooked (1).	2	One mark for a consequence plus one further mark for explanation. Do <b>not</b> award 'confusion' as a reason for the poor outcomes.

C	Questi	on	Answer	Marks	Guidance
3	(a)		<ul> <li>Responses include:</li> <li>will know which activities must be completed on time so that the project is not delayed</li> <li>will know which activities need most closely monitoring</li> <li>will know which activities may need additional resources</li> <li>will know which resources to reallocate</li> <li>will allow the project to complete in the shortest possible time.</li> </ul> Exemplar responses: Identifying the critical path will show which activities need monitoring most closely (1) so that Charlie can prioritise the use of his time more effectively (1).	2	<ul> <li>One mark for identification plus one further mark for explanation.</li> <li>NB The question is about the benefits of identifying the critical path (rather than the benefits of critical path analysis in general).</li> <li>For full (two) marks the benefit to Charlie must be clear.</li> <li>Do <b>not</b> award 'speed up' the project.</li> </ul>
3	(b)		Indicative content: 1700 + 1560 + 1640 + 1420 + 1300 + 1380 + 1220 = 10220 10220/7 = 1460 1960 - 1460 = 500 litres per tyre	2	Award full (two) marks for correct answer: 500. Else award one mark for 1460, if seen. Units i.e. 'litres per tyre' not required.
3	(c)	(i)	Indicative content: <ul> <li>primary.</li> </ul>	1	One mark for a correct identification. Contradictory response rule applies (see preamble item 5) i.e. if two circles are drawn, award zero.
3	(c)	(ii)	<ul> <li>Indicative content:</li> <li>objective <ul> <li>carbon (monoxide), nitrogen (dioxide), humidity.</li> </ul> </li> <li>subjective <ul> <li>comfort, odour.</li> </ul> </li> </ul>	2	One mark for example of objective feedback. And/or One mark for example of subjective feedback. Short answer question rule applies (see preamble item 5) e.g. if several pieces of feedback are suggested, mark the first one only.

Question	Answer		Guidance
3 (c) (iii)	<ul> <li>Responses include:</li> <li>carbon monoxide (levels) – improved/reduced, lower than the industrial standard</li> <li>nitrogen dioxide (levels) – improved/reduced, lower than the industrial standard</li> <li>(relative) humidity – unchanged, within the industrial standard</li> <li>(employee perception of) comfort – worsened, still just within the industrial standard</li> <li>(employee perception of) odour – improved, now within the industrial standard.</li> <li>Exemplar responses:</li> <li>Carbon monoxide and nitrogen oxide levels have reduced (2), as has the perception of odour (1). Humidity is unchanged (1). Unfortunately, employee comfort has deteriorated (1), suggesting that although the company has acted as a responsible employer (+1) the employees do not feel the benefit.</li> <li>Carbon monoxide and nitrogen oxide levels have reduced (2), Humidity is unchanged (1). Unfortunately, employee comfort has deteriorated (2), Humidity is unchanged (1). Unfortunately, employee comfort has deteriorated (2), Humidity is unchanged (1). Unfortunately, employee comfort has deteriorated (2), Humidity is unchanged (1). Unfortunately, employee comfort has deteriorated (1), suggesting that although the company has acted as a responsible employer (0).</li> <li>Employee perception of comfort has worsened (1), humidity is unchanged (1) but the other 3 factors have all improved (3).</li> <li>All 5 factors are now within acceptable industrial standards (5) so the results are consistent with the company's aim of being a responsible employer (+1).</li> </ul>	6	Up to six marks. Award one mark for each factor assessed plus a further one additional mark for a clear decision if all <u>five</u> factors have been correctly assessed. No marks for quoting the data.

Unit 24

Question	Answer	Marks	Guidance
	The new heating system has had no effect on humidity levels (1). It has however reduced the employees' perception of odour (1) and reduced nitrogen dioxide (1) and carbon monoxide emissions (1). However, since all of these were within industrial standards even before the new installation, the key criteria for judging the impact on the employees' working environment is how comfortable they feel. Since the perception of employee comfort has fallen by 18 percentage points (1), I conclude that employees may not see the new heating system as an improvement. Thus detracting from the company's aim of being seen as a responsible employer (+1).		

Question	Answer	Marks	Guidance
3 (d)	<ul> <li>Indicative content:</li> <li>German business <ul> <li>fewest miles travelled/close to UK (1); positive reputation (as a very good employer) (1); gives some money to charity (although at half the rate of HD Tyres) (1); pays good wages (above UK average) (1); max 4 marks.</li> </ul> </li> <li>Turkish business <ul> <li>second fewest miles travelled (1), low (second lowest) carbon emissions (1), gives money to charity (at same rate as HD Tyres) (1); max 3 marks.</li> </ul> </li> <li>American business <ul> <li>pays the best wages (well above UK average) (1); reputation (as a good employer) (1); max 2 marks.</li> </ul> </li> <li>Chinese business <ul> <li>lowest level of carbon emissions (1); max 1 mark.</li> </ul> </li> </ul>	4	Up to four marks for justification (dependant on which business selected). <b>NB</b> Positives required, no marks for reasons not to choose a business. No marks for quoting the figures. Reference to purchasing power must clearly refer to employee wages being good.

C	Question		Answer	Marks	Guidance
4	(a)	(i)	<ul> <li>Indicative content:</li> <li>Reduce water consumption Site 2 – variance favourable</li> <li>Reduce water consumption Site 3 – expected 12%</li> <li>Install new heating system Site 1 – actual 24%</li> <li>Install new heating system Site 2 – variance 4%</li> <li>Install new heating system Site 3 – actual 24%</li> <li>Use recycled steel – variance adverse.</li> </ul>	6	One mark for each correct identification.
4	(a)	(ii)	<ul> <li>Responses include:</li> <li>benefit e.g. no need to wait for more data, can report earlier, etc.</li> <li>drawback e.g. not long enough, not enough data, may have been teething problems, small error extrapolated to one year is likely to be inaccurate, actual performance does not necessarily predict future performance, etc.</li> </ul>	4 (2 x 2)	One mark for a correct benefit, plus one further mark for explanation. And/or One mark for a correct drawback, plus one further mark for explanation. Too early TV
			Exemplar response: One benefit of using the first three week's performance statistics to forecast annual carbon reduction is that the data is immediately available (1) so Charlie can quote this figure in his final project report due to be completed later this month (1). One drawback of using this data to forecast future performance is that the carbon reduction may be understated (1) making the forecast inaccurate (1).		

Q	Question		Answer	Marks	Guidance
4	(b)	(i)	Indicative content:	2	One mark for a correct identification plus one further mark for explanation.
			Informal feedback method		
			Reasons include:		Do <b>not</b> award answers relating to the location e.g. being in a relaxed environment/casual setting/public place.
			No set format		
			No specific date/time scheduled		
			No written evidence		
			No record kept		
			Not recorded		
			Exemplar response:		
			Chat is categorised as an informal feedback method (1). One reason for this is because the conversation has no set format (1).		

Question	Answer		Guidance	
4 (b) (ii)	<ul> <li>Responses include:</li> <li>advantage e.g. can see body language, can gauge emotions, feelings can be expressed, can see gut reactions, two-way communication, does not rely on technology, etc.</li> <li>disadvantage e.g. not written down, no record, requires Charlie to be in the canteen at the right time, etc.</li> <li>Exemplar response:</li> <li>One advantage to Charlie of using chat is he can see their emotions (1), giving a more accurate picture of Leo's true feelings (1).</li> <li>One disadvantage to Charlie is that there will be no written record (1) of the chat so he may forget something that Leo says (1).</li> </ul>	4 (2 x 2)	One mark for a correct advantage, plus one further mark for explanation. And/or One mark for a correct disadvantage, plus one further mark for explanation. Do <b>not</b> award responses relating to being informal, subjective or a primary research method. Do <b>not</b> award answers about the amount of feedback, potential bias, speed, convenience, first hand, direct, etc.	

Q	Question		Answer	Marks	Guidance
4	(b)	(iii)	<ul> <li>Responses include:</li> <li>to publicise corporate improvements</li> <li>to attract investors</li> <li>to show clients</li> <li>to improve on weaknesses</li> <li>to celebrate strengths</li> <li>to adjust objectives</li> <li>to estimate future costs of projects.</li> </ul> Exemplar responses: Ben could issue a press release showing what the company has done to reduce its carbon footprint (CONT) (2). Ben could use any weaknesses identified to improve training provision (1).	2	Award: Two marks for a contextual response. One mark for a non-contextual response. Do <b>not</b> award 'drive business improvement'. For context look for: tyres, CO <sub>2</sub> , emissions, tractors, agriculture, aircraft, aeronautical, 10% profits, ethical, environmentally friendly, corporate social responsibility, carbon, etc.

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