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Mark Scheme (Results)
Summer 2010

GCSE

GCSE Design and Technology: Systems and Control (3974)
Paper 3F
Foundation Written Paper.

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Publications Code.

General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Introduction:

Give / State / Name
Normally a one or two word answer, at the very most a short sentence.

Describe
Normally, one or two sentences which form a description, making reference to more than one point. All points must be linked for a complete answer.

Explain
Normally, one or two sentences which form an explanation. This requires a clear or detailed account of something and includes a relevant justification, reason or example.

Evaluate
Normally one or two sentences where the quality, suitability or value of something is judged. This can include both positive and negative points, with each point normally, requiring a relevant justification.

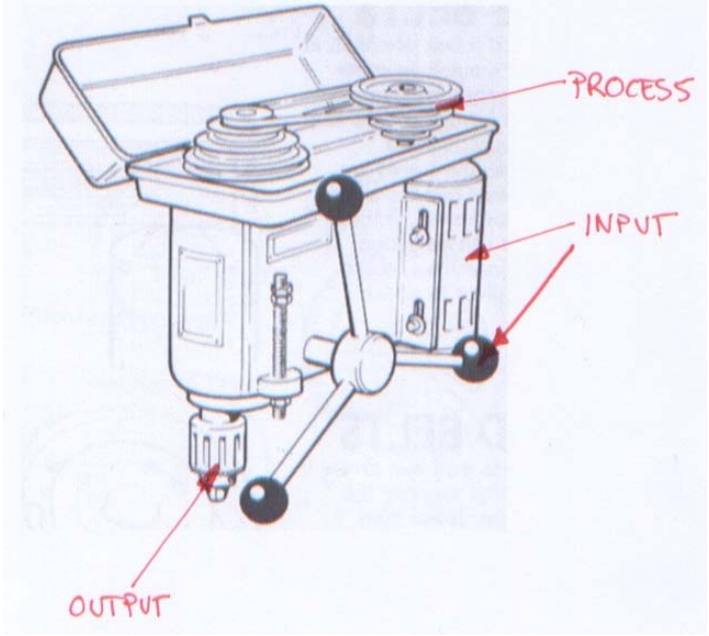
The mark scheme contains a range of possible answers for all questions. For some questions it is possible to provide a finite number of acceptable answers. However, in some instances it is not possible to provide every conceivable answer. In these instances objective guidance is provided.

For all answers candidates are not expected to give the exact wording contained in this mark scheme. However, to gain credit their answer must demonstrate the same meaning as detailed in the mark scheme.

It is the examiner's responsibility to apply their professional judgement in determining if what the candidate has written has the same meaning as the answer detailed in the mark scheme. For all answers the *'Key words'* have been written in bold text.

For describe and explain questions, candidates may give a different combination of the marking points listed in the mark scheme. In such instances candidates can be rewarded for the marking points provided that they are suitably linked. However, candidates cannot be rewarded for the same point repeated in two different combinations.

Question Number	Answer	Mark
1974_3F_Q01ai-ii	Name: tape / tape measure / measuring tape (1) Use: measuring / taking measurements (1) Name: nut (only answer) (1) Use: holding things together / in place (1) Name: worm gear / worm wheel (only answers) (1) Use: reducing speeds / converting rotary motion through 90^0 (1) Name: die (only answer)(1) Use: cutting a screw thread (1) Name: Digital camera / camera (1) Use: Taking / storing photographs / video (1) **(10x1)**	**(10)**

Question Number	Answer	Mark
1974_3F_Q01b	 INPUT (1) motor / handle PROCESS (1) belt drive OUTPUT (1) chuck	**(3)**

Question Number	Answer	Mark
1974_3F_Q01c	**Two** safety precautions given from: • Wear goggles (1) • Tie back hair (1) • No jewellery / bracelets (1) • Make sure work is held tight / secure (1) • Only one user at a time (1) • Correct speed for size of drill (1) • Drill is in tight (1) • Chuck key is removed (1) • Make sure the lid is closed (1) • Make sure the guard is down (1) **(2x1)**	**(2)**

Question Number	Answer	Mark
1974_3F_Q01d	1. batch (1) 2. virtual (1) 3. email (1) (only answers) **(3x1)**	**(3)**

Question Number	Answer	Mark
1974_3F_Q01e(i)	**Two** reasons given from: • Allows 3D models to be created / viewed (1) • Easy to amend / change (1) • Easy storage / retrieval of data (1) • Designs can be sent via e_mail / attachments (1) • Easy to convert to CAM (1) • The model / design can be tested / simulations run (1) **(2x1)**	**(2)**

Question Number	Answer	Mark
1974_3F_Q01e(ii)	**One** reason explained from: • **Production will be 24/7**(1) therefore **production will be non-stop** (1) • **Fewer workers required** (1) which means **less labour costs** (1) • **Once programmed / set up** (1) it can be **recalled / uploaded at any time (1)** • **Changes / amendments** (1) can be **quickly implemented** (1) • **Very accurate** (1) therefore **cutting down on waste / rejects** (1) **(2x1)**	**(2)**
	Total for question 1	**22 marks**

Question Number	Answer	Mark
1974_3F_Q02a	• Mild steel (1) (only answer) **(1x1)**	**(1)**

Question Number	Answer	Mark
1974_3F_Q02b	• Rotary / rotational / circular / rotation (1) (only answers) **(1x1)**	**(1)**

Question Number	Answer	Mark
1974_3F_Q02c	• **A:** Pitch / lead (1) • **B:** Crest (1) • **C:** Root (1) (only answers) **(3x1)**	**(3)**

Question Number	Answer	Mark
1974_3F_Q02d	• Buttress (1) *(only answer)* **(1x1)**	**(1)**

Question Number	Answer	Mark
1974_3F_Q02e	**Two** reasons given from: • reduces wear (1) • stops rusting (1) • makes it easier to use / turn (1) **(2x1)**	**(2)**

Question Number	Answer	Mark
1973_3F_Q02f	**(i)** Cotter pin (1) **(ii)** Keyway (1) **(iii)**Splined shaft (1) *(only answers)* **(3x1)**	**(3)**

Question Number	Answers	Mark
1974_3F_Q02g	**Three** benefits given from: • greater / improved product reliability (1) • safe to use / product has met minimum safety standards (1) • less likely to break (1) • has a guarantee / gives consumer confidence in product / enhanced product value (1) *(Response must be focused to advantages for the consumer)* **(3x1)**	**(3)**

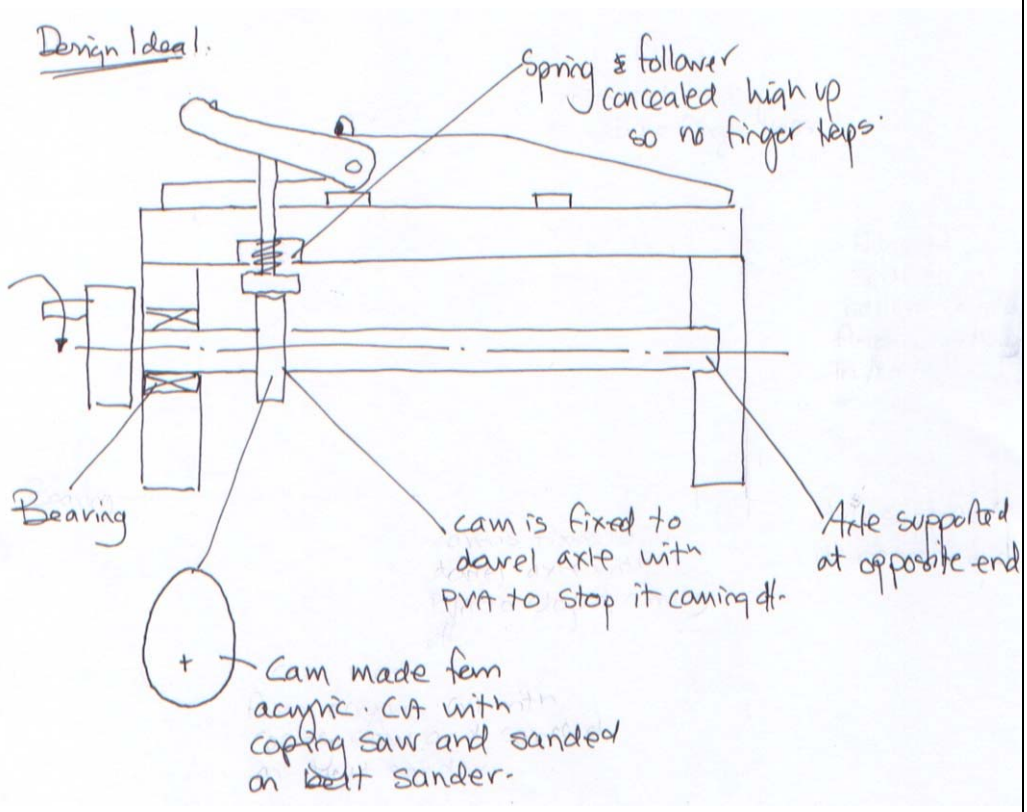
Question Number	Answer	Mark
1974_3 F_Q02h	**Two** ways given from: • the whole process is cheaper / will save money (1) • new products will come to the market faster (1) • more reliable products / greater quality control (1) • greater product availability (1) *(Response must be focused to benefits for the consumer)* **(2x1)**	**(2)**

Question Number	Answer	Mark
1974_3 F_Q02i(i)	**Two** advantages given from: • Reduced pollution / contamination of the ground / less harm environment (1) • Decreases landfill / waste production (1) • Removes the need to mine new materials / reduces damage to landscape (1) **(2x1)**	**(2)**

Question Number	Answer	Mark
1974_3 F_Q02i(ii)	**Two** reasons given from: • Reduction of greenhouse gases / global warming (1) • To prevent harm to local residents (1) • To prevent toxic gases (1) • To prevent pollution of rivers/air / to prevent killing wildlife / to prevent harming wildlife (1) • Legal requirements / responsibility / COSHH (1) • Protect workers / workforce (1) **(2x1)**	**(2)**

Question Number	Answer	Mark
1974_3 F_Q02j	**One** way described from: • Parts may be collected (1) and used in new products (1) • Broken down into different parts/materials (1) and melted to be reused (1) **(2x1)**	**(2)**
	Total for question 2	**22 marks**

Question Number	Answer	Mark
1974_3F_Q03a	**Design Idea 1** Each point of the specification has two marking points. 1 mark should be awarded for evidence of each point of the specification resolved in the design. When an answer does not viably answer a specification point 0 marks For each specification point with only one element viably satisfied 1 mark For each specification point with both elements viably satisfied 2 marks Candidates may answer any specification point in either graphical form or by annotation. **No marks are awarded for the quality of communication** Each specification resolved in design **Specification point 1** The mechanical toy must make the crocodile's mouth open and close • Evidence given / shown that the mouth opens (1) Eg. Cam and follower / crank shaft Evidence given / shown that the mouth closes (1) Eg. Springs / falls under its own weight / crankshaft pulls it back down **Specification point 2** The mechanical toy allows the handle to rotate smoothly • Evidence given / shown that the handle rotates (1) Eg. Hole in side panel / support from either side /supported at other end Evidence given / shown that it is smooth (1) Eg. Bushes / bearings **Specification point 3** The mechanical toy is safe and durable • Evidence given / shown that the materials / systems are safe (1) Eg. No finger traps / cutting the skin / small parts coming off / swallowing • Evidence given / shown that the materials / systems are durable (1) Eg. Fixing methods secure / robust **Specification point 4** The mechanical toy must be made using materials and processes suitable for one-off production. • Specific material named (1) • Process given (1) Eg. tools / process / machinery	**(8)**



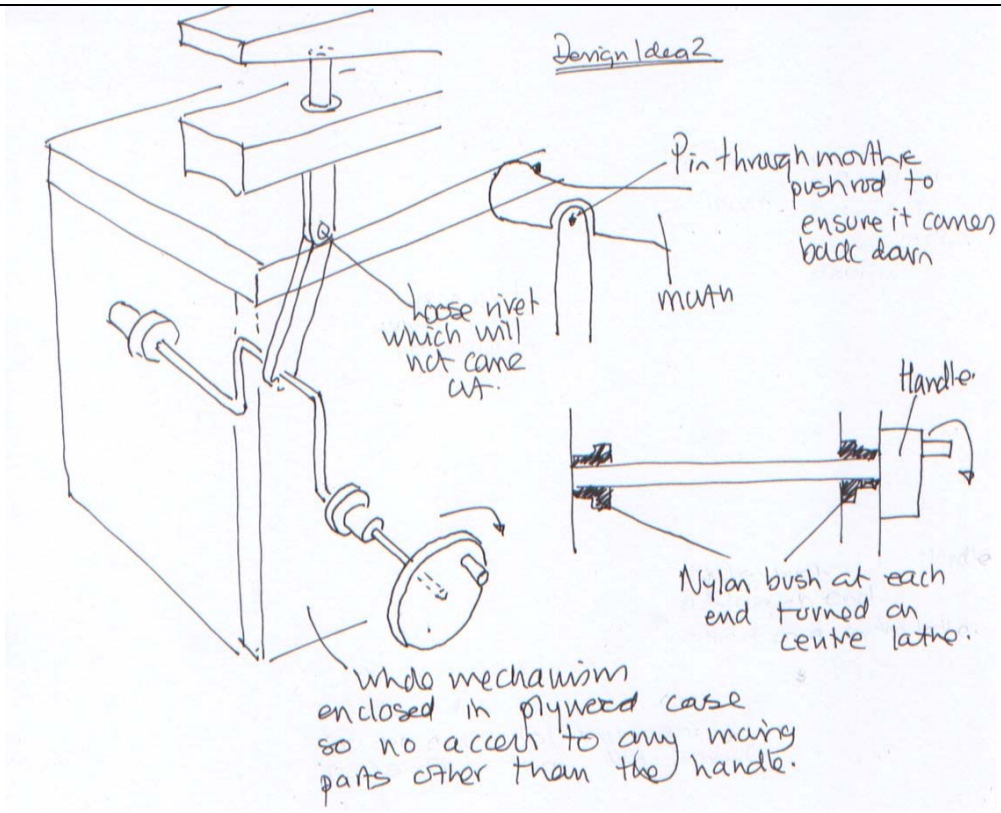
Design Idea 2

To score a mark for Design Idea 2, each specification point must be resolved in second design idea but the second design idea **must be technically / conceptually different in design and construction** from the first and not a simple variation on a theme to score the mark.

Use exactly the same criteria as design idea 1 to mark design idea 2.

A different method of opening (1)
A different method of closing (1)
A different method of rotating (1)
A different method of smoothly (1)
A different safety feature (1)
A different method of fixing / durable feature (1)
A different specific material named (1)
A different suitable process (1)

(8)



Question Number	Answer	Mark
3(b)	Each point clearly evaluated. If a candidate has indicated design idea 1 and then evaluates design idea 2 for all or part of (i), (ii) or (iii) then the idea in greater evidence should be marked. The evaluation of the design must contain reference to either positive or negative aspects not simply just a description of the design. Award 1 mark for a correct evaluation / justification relating to each design feature and how it succeeds or fails. Repetition of original spec scores 0.	
3(b)(i)	The mechanical toy must make the crocodile's mouth **open** and **close** • Method to open (1) • Method to close (1)	**(2)**
3(b)(ii)	The mechanical toy allows the handle to **rotate smoothly** • Method of holding the handle in place / support (1) • Provision of a bearing / bush (1)	**(2)**
3(b)(iii)	The mechanical toy is **safe** and **durable** • No sharp pieces / edges / bits to pull off (1) • Fixing method will withstand rough use / handling (1)	**(2)**
	Total for question 3	**22 marks**

Question Number	Answer	mark
1974_3F_Q04a(i)	**Three** each of the following: Specification points Reasons (Do not accept repetition of the specification points) **<u>Quality</u>** **Point**: strong / rigid construction / handle (1) **Reason**: to withstand pressures / forces applied (1) **Point**: smooth edges (1) **Reason**: so no injury is caused to the user (1) **Point**: accurate fitting of the jaws (1) **Reason**: so they do not fall off and get lost (1) **Point**: materials suitable for exterior use (1) **Reason**: longer life span / greater reliability (1) **Point**: durable materials (1) **Reason**: so that it lasts a long time / low maintenance (1) **(2x1)**	**(2)**
1974_3F_Q04a(ii)	**<u>Environment</u>** **Point**: use of recycled materials (1) **Reason**: so existing materials / resources are preserved (1) **Point**: materials should recycled once the product has reached the end of its useful life (1) **Reason**: so that the materials may be used for something else / preserving resources (1) **(2x1)**	**(2)**
1974_3F_Q04a(iii)	**<u>Safety</u>** **Point**: easy to retract jaws (1) **Reason**: in case fingers get caught (1) **Point**: textured handle (1) **Reason**: so it is soft your hand will not slip in use (1) **Point**: strong materials (1) **Reason**: so that they do not break / fail / collapse when clamping heavy loads (1) **Point**: finished well (1) **Reason**: no sharp edges to injure users (1) **(2x1)** Some flexibility should be given as some points may cross over descriptions. *(do not accept/credit if already given in a(i))*	**(2)**

Question Number	Answer	Total mark
1974_3F_Q04b	**Two** reasons given from: • readily available in range of sizes / shapes (1) • easily machined / cut (1) • can be finished in different ways / colours (1) • relatively cheap (1) • good compressive strength (1) • can be recycled once it reaches the end of its useful life (1) *(Do not accept can be easily joined by welding / brazing)* **(2x1)**	**(2)**

Question Number	Answer	mark
1974_3F_Q04c	**Two** reasons given from • good surface finish / self finishing / no additional surface finishing required (1) • suitable for mass / high volume production (1) • repeatability / identical (1) • many can be made in one mould (1) • high tolerance / very accurate (1) • colours can be changed (1) • unit costs are low once mould has been paid for (1) • can produce a complex form (1) *(Do not accept easy / quick / cheap / unless qualified)* **(2x1)**	**(2)**

Question Number	Answer	mark
1974_3F_Q04d	**Two** properties and reasons given from: **Property**: good compressive strength (1) **Reason**: will withstand the large forces applied (1) **Property**: toughness / high impact strength (1) **Reason**: will stand up to knocks and bumps / will withstand things being dropped into it (1) **Property**: elasticity (1) **Reason**: will return to its original shape once deforming force has been removed (1) *(Do not accept strong)* **(2x1)** **(2x1)**	**(4)**

Question Number	Answer	Mark
1974_3F_Q04e	**One** reason explained from: • **To make sure that items are correct size / dimensionally accurate / within tolerances** (1) so that they **will all fit together** (1) • **To check that the item has been correctly assembled** (1) so that **it does not fall apart / collapse which might cause an injury to the user** (1) **(2x1)**	**(2)**

Question Number		Mark
1974_3F_Q04f	**One** explanation from: • **Improves aesthetic appeal** (1) which will **attract users / purchaser** (1) • **Protective layer** (1) which means **that it will not rust / corrode** (1) **(2x1)**	**(2)**

Question Number	Answer	Mark
1974_3F_Q04g (i)	Be able to be used with only one hand **One** explanation from: • **The shape of the handle** (1) allows it to be **gripped / held and the trigger to be squeezed at the same time** (1) • **A squeezing / trigger action is required** (1) rather than **a turning action** (1) **(2x1)**	**(2)**
1974_3F_Q04g (ii)	Not cause any damage to the work being clamped **One** explanation from: • **The large surface area of the jaws** (1) allows the **force to be distributed over a larger area** (1) • **The nylon jaws are relatively soft** (1) and will therefore not **dig into / scratch the surface of the work being clamped** (1) **(2x1)**	**(2)**
	Total for question 4	**22 mark**
	Total for paper	**88 mark**

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