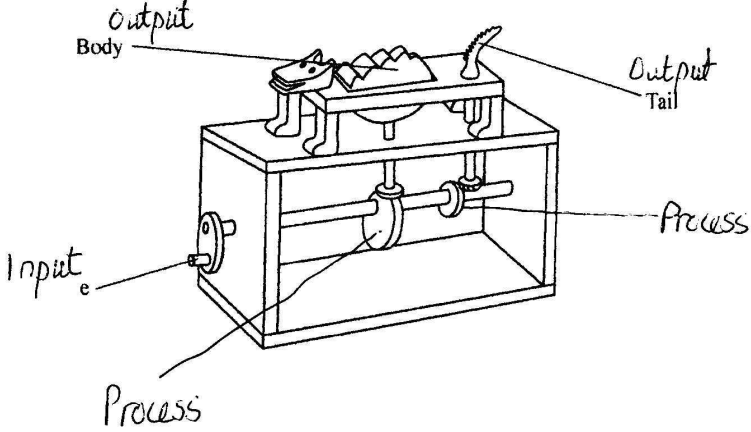# Mark Scheme (Results)

Summer 2008

GCSE Design & Technology:
Systems & Control Technology (1974) Paper 3F

1974 3F Mark Scheme

Question Number	Answer	Mark
1 (a)(i)	Name the following: • File / Rasp / Float • Brush / Paint brush • Ratchet / Pawl / Ratchet and Pawl / Click / Ratchet and Click • Brake/break / Bike/Bicycle brake / Calliper brake /Calliper • Robotic/CNC/Cam Hydraulic/Pneumatic/electronic/mechanical arm (5 x 1)	**(5)**
1 (a)(ii)	Use the following: • Filing / Wasting / Removing unwanted material / Cleaning up / Smoothing / Finishing / Removing sharp edges • Painting/Varnishing / Applies paint/marking blue/coolant/varnish/glue / Removing/Cleaning swarf/dust/saw dust • Mechanical process / one way rotary motion / controlled rotary motion / Winding up mechanisms *(accept a valid named mechanism e.g. fishing reel, clock, hand brake in car etc.)* • Braking / Stopping / Slowing down / Retarding • Pick and place/solder/moves components/parts/heavy objects/spray paints (5 x 1) *Only accept 'pick and place' alone in (i) or (ii)*	**(5)**
1 (b)	Two safety precautions given: • Keep flame in hot area/brazing hearth/away from others • Wear heat resistant gloves • Wear goggles/visor/glasses • Keep others out of hot area • Wear heat protective apron • Hang torch after use • Switch off after use • Hold torch at bottom end (2 x 1)	**(2)**

1 (c)	Three labels given:		
		(3 x 1)	**(3)**
1 (d)	Three pieces of information given: • Selling price • Product description • Stock control number *(only acceptable answers)*		
		(3 x 1)	**(3)**
1 (e)	Two reasons given: • See if it works • See if it looks good • Test physical dimensions • Test reliability • Quantify costs • Rectify faults before production • Safe to use/test it conforms to BS • Test consumer reaction/feedback		
		(2 x 1)	**(2)**
1 (f)	One task described: • A **scanner** looks at the product for **quality control / computers automatically test products** • A **computer controls** a **CNC machine / robotic arms** • An **automatic counter** is used for **stock control / reordering for a customer** • **CNC machines work together** to **built a product** • **Automatic machines pack the products** in **customer batches /** to **order** • **CNC machines can be allocated** as **they are needed**		
		(2 x 1)	**(2)**
		Total for question	**22**

Question Number	Answer	Mark

2 (a)(i)	Three terms named:
	
	   • A - Fulcrum
	   • B - Effort
	   • C – Load
	
	  (only acceptable answers) (3 x 1)
		(3)

2 (a)(ii)	The class identified:
	
	   • 2/Two/To/Too/2nd class/second class.
	                                     (1 x 1)
	(only acceptable answer)
		(1)

2 (b)(i)	One gear system described:
	
	   • **Bevel gears have the drive gear and driven gear** offset by **90 degrees**
	   • The **handle gear is bigger than the chuck gear** making it **easy to turn** / making it **go faster**
	   • The handle **turns the handle bevel gear** which **meshes with the chuck gear** to drive the chuck
	   • When the handle turns **the handle bevel gear** the **chuck turns at 90 degrees** to the handle bevel gear
	                                       (2 x 1)
		(2)

2 (b)(ii)	One speed calculated:
	
	   • Number: 400
	       Unit: rpm
	                                       (2 x 1)
		(2)

2 (c)(i)	One gear system named:
	
	   • Rack and pinion
	                                       (1 x 1)
	(only acceptable answer)
		(1)

2 (c)(ii)	The motion given:
	
	   • Rotary/Rotational/Oscillating/Circular
	                                       (1 x 1)
	(Only acceptable answers)
		(1)

2 (c)(iii)	The motion given:
	
	   • Linear/ reciprocation / reciprocating
	                                       (1 x 1)
	(Only acceptable answers)
		(1)

| 2 (d)(i)	One reason given • The spring would break • It could lock Gears could be stripped / fall apart / axle break (1 x 1)	**(1)**
2 (d)(ii)	One function and one reason given: **Function:** Moving parts are protected **Reason:** Danger to fingers/body parts / cuts dangerous if hair/clothing gets caught **Function:** Key must stay in place **Reason:** Small components could be swallowed (2 x 1)	**(2)**
2 (e)	Three advantages given: • Light • Easily cleaned • Easily moulded into complex shapes • Can be coloured • Does not shatter / good impact resistance / tough • Good strength to weight ratio • Durable/lasts a long time • Electrical/heat insulator (3 x 1)	**(3)**
2 (f)(i)	One sentence completed: • Planned obsolescence (1 x 1) *(only acceptable answer)*	**(1)**
2 (f)(ii)	One sentence completed: • Changing fashion *(only acceptable answer)*	**(1)**
2 (g)(i)	One disadvantage given: • Replacements use valuable resources • Could pollute/contaminate the ground • Components takes a long time to degrade • Increases landfill (1 x 1)	**(1)**
2 (g)(ii)	One way described: • Cases/parts may be **collected** and **used in new cases/toys** • **Broken down into different material parts** and **melted to be reused** • **Put it in** a **recycling bin** (2 x 1)	**(2)**
	Total for question	**22**

Question Number	Answer	Mark

3 (a)	**DESIGN IDEA 1**
	Each point of specification has two marking points.
	
	1 mark should be awarded for evidence of each point of specification resolved in the design.
	
	2 marks For each specification point with both elements viably satisfied
	
	1 mark For each specification point with only one element viably satisfied
	
	0 marks Where the answer does not viably answer a specification point
	
	Candidates may answer any specification point in either graphical form or by annotation.
	No marks are awarded for quality of communication.
	
	Specification point 1
	Have axles that rotate smoothly:
	
	• Evidence to indicate that the axles rotate (1)
	  E.g has axles and they will rotate
	• Evidence to indicate that they rotate smoothly (1)
	  E.g Reduction of friction/ oil / ball race/ PTFE / other
	  types of bearing / free of obstruction / spacers
	
	Specification point 2
	Have a figure that moves up and down when the toy is pulled along:
	
	• Evidence to indicate that the figure will move up and down (1)
	  E.g. Any mechanism or spring/
	• Evidence to indicate that it will move up and down when being pulled (1)
	  E.g. Crank and slider / cam and follower /
	
	Specification point 3
	Have wheels fixed securely to the axles:
	
	• Evidence to indicate that it has wheels fixed to axles (1)
	  E.g. Nuts / glue / friction
	• Evidence to indicate that they are secure (1)
	   E.g. Locking nuts / cotter pins / grub screws /split pins / spring washer
	
	Specification point 4
	Be made from materials and processes suitable for one-off production:
	
	• Evidence to indicate that the material is suitable for one-off production (1)
	• Evidence to indicate that the process is suitable for one-off production (1)	

Possible graphical solutions:

Design Idea 1

Mild steel rod
Hot bent on
Jig **(4a&b)**   Rowing
                    figure

Crank and   Nylon bearing **(3a&b)**
Slider **2a&b**
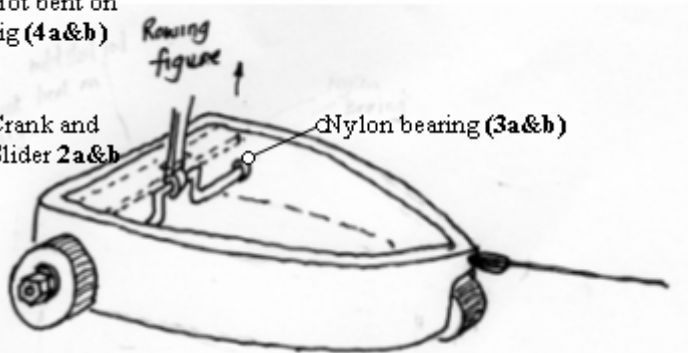
Wheels held on by nuts **(1a)** with locking washers **(1b)**

(8)

DESIGN IDEA 2
To score a mark for Design Idea 2, each specification point must be resolved
again in the 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 rotating axle (1)
A different method of rotating smoothly (1)
A different method of up and down (1)
A different method of up and down when pulled (1)
A different method of fixing to wheel (1)
A different method of securely fixing (1)
A different material (1)
A different process (1)

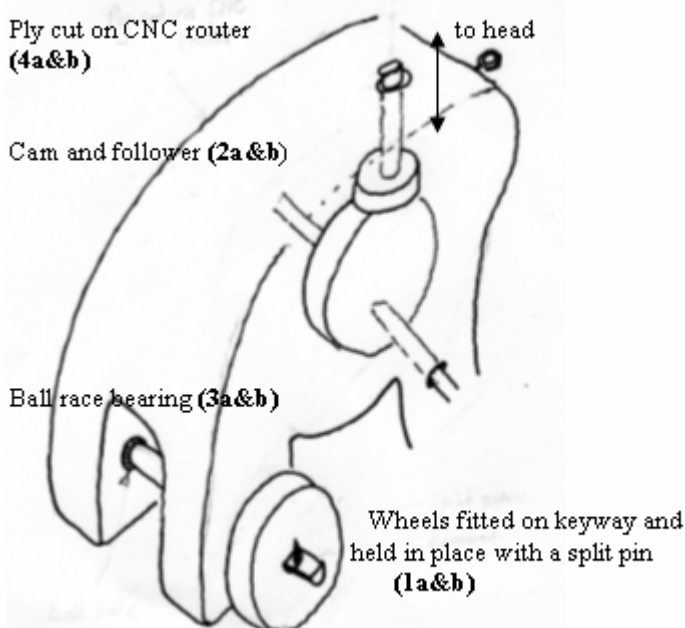Possible graphical solutions:
Design Idea 2

Ply cut on CNC router   to head
(4a&b)

Cam and follower **(2a&b)**

Ball race bearing **(3a&b)**

Wheels fitted on keyway and
held in place with a split pin
(1a&b)

(8)

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) & (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 just simply 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)	Positive or negative reasons relating to: • Rotating axles • Smoothly rotating (2 x 1) *E.g. The acrylic bearings allow the wooden axles to rotate but if the wood swells when damp they could get stuck*	**(2)**
3 (b)(ii)	Positive or negative reasons relating to: • Method of fixing • Method of securely fixing (2 x 1) *E.g. The nut is easy to use but if the toys is pulled backwards it could come undone.*	**(2)**
3 (b)(iii)	Positive or negative reasons relating to: • The material used • The process used (2 x 1) *Acrylic is easy to shape and clean but the bend will be difficult to achieve on a line bender*.	**(2)**
	Total for question	**22**

Question Number	Answer	Mark
4 (a)	Three each of the following, one under each heading: Specification points Reasons (i) Market **Point**: It must be cost effective/cheap **Reason**: so that more people buy them **Point**: It must be easy to use **Reason**: To be used by DIY cross section **Point**: It must be well finished **Reason**: Advantage over competitors (ii) Quality **Point**: The locking system must be secure **Reason**: Does not collapse under pressure **Point**: Must be stable/sturdy **Reason**: Does not rock whilst working **Point**: The mechanism must be smooth **Reason**: Easy to operate (iii) Environment **Point**: It must be made from recyclable materials **Reason**: To conserve the earth's resources **Point**: Can be recycled **Reason**: To save resource / reduce landfill / reduce waste pollution **Point**: It must be robust **Reason**: So it withstands rough treatment **Point**: It must have a finish that protects it from rusting **Reason**: Does not deteriorate if stored in shed/garage Some flexibility should be given as some points may cross over descriptions.	(2) (2) (2)
4 (b)(i)	Two reasons given: - Good compressive strength - Hard - Tough - Can easily be welded/joined - Rigid - Cheaper than aluminium *(Do not accept 'cheap' by itself)* - Readily available - Rigid when pressed into shapes (2 x 1)	(2)

4 (b)(ii)	Two reasons given: • The steel would rust without it • It gives marketable product/looks/different colours • Cost effective finish • Gives a uniform finish • Covers sharp edges / Protects against sharp edges • Easily applied when healed • Durable finish • Prevents electric shocks • Insulator • Easy to maintain/clean (2 x 1)	**(2)**
4(c)	Two properties given with two reasons: **Property**: Stronger **Reason**: Because of its construction/way it's made **Property**: Stable / dimensional stability / will not split **Reason**: Does not warp / no grain **Property**: Weatherproof/resistant to decay **Reason**: Because of waterproof glue / has a longer working life **Property**: Lighter **Reason**: Workbench is easier to move **Property**: Has a longer working life / Durable **Reason**: Resistant to decay (2 x 1) (2 x 1)	**(4)**
4(d)	Two quality control checks named: • Plastic handles operate correctly (1) • Folding linkage test (1) • Feet locking and folding test (1) • Tops opening and closing check (1) • Worktop locking/release mechanism works (1) • Durability of work top (1) • Plywood strong enough (1) • Plywood has lines in correct place (1) • Colour of handles (1) • Quality of surface finish/plastic coating (1) • Strength of frame (1) • Stability (1) • Grip on feet (1) • Dimensional accuracy (1) • Safety of edges (1) • Safe to use (1) (2 x 1) (Do not accept safety alone)	**(2)**

4(e)	One way described: • A thermoplastic may be **easily cast/moulded** into a **complex shape** • A thermoplastic may be **softened** with heat to flow into a **complex mould** (2 x 1)	**(2)**
4 (f)(i)	One way explained: • The **levers next to the winding handles are operated** causing the **linkage to fold down** • The **legs fold inwards** therefore **the whole bench gets smaller/folds flat** (2 x 1)	**(2)**
4 (f)(ii)	One way explained: • **The plastic handles are attached to the long screws** which **adjust the work tops** • **The work tops are adjustable** therefore **different sizes and shapes may be held** (2 x 1)	**(2)**
	Total for question	**22**
	Total for paper	**88**