



# **2014 Product Design**

## **Higher**

### **Finalised Marking Instructions**

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## **Part One: General Marking Principles for Product Design Higher**

This information is provided to help you understand the general principles you must apply when marking candidate responses to questions in this Paper. These principles must be read in conjunction with the specific Marking Instructions for each question.

- (a)** Marks for each candidate response must always be assigned in line with these general marking principles and the specific Marking Instructions for the relevant question. If a specific candidate response does not seem to be covered by either the principles or detailed Marking Instructions, and you are uncertain how to assess it, you must seek guidance from your Team Leader/Principal Assessor. *You can do this by posting a question on the Marking Team forum or by e-mailing/phoning the e-marker Helpline.*
- (b)** Marking should always be positive ie, marks should be awarded for what is correct and not deducted for errors or omissions.

### **GENERAL MARKING ADVICE: Product Design Higher**

The marking schemes are written to assist in determining the “minimal acceptable answer” rather than listing every possible correct and incorrect answer. The following notes are offered to support Markers in making judgements on candidates’ evidence, and apply to marking both end of unit assessments and course assessments.

**Part Two: Marking Instructions for each Question**

**SECTION A**

Question		Expected Answer(s)	Max Mark	Additional Guidance
1	(a)	<p><b>The Cooling Fan must:</b></p> <ul style="list-style-type: none"> <li>• Provide a cool air circulation</li> <li>• Have an oscillating operation</li> <li>• Be stable</li> <li>• Have low noise when in operation</li> <li>• Be adjustable in height (Pedestal fan only)</li> <li>• Be easily stored when not in use</li> <li>• Have variable speed of operation</li> <li>• Be remote controlled (Bladeless fan only)</li> <li>• Be manufactured from <b>durable</b> materials that are suitable and appropriate for their function</li> <li>• Be priced to suit the intended target market</li> <li>• Ensure aesthetics suit the market niche or consumer aspirations</li> <li>• Have production costs significantly less than selling price</li> <li>• Be easy to clean/maintain</li> <li>• Comply with relevant safety regulations/ safe for all users (no moving parts – Bladeless fan only)</li> <li>• Any other suitable statement.</li> </ul> <p><b>six statements @ 1 mark each</b></p> <div style="border: 1px solid black; padding: 5px;"> <p>Comments Accept Lifespan Portability Easy to operate Sustainability</p> </div>	6	Do not accept – Must be safe (without valid explanation)

Question		Expected Answer(s)	Max Mark	Additional Guidance
1	(b)	<p><b>Statements which justify issues such as:</b></p> <ul style="list-style-type: none"> <li>• Durability of material (<i>non-corrosion</i>)</li> <li>• Strength to weight issues</li> <li>• Readily available materials</li> <li>• Nylon – self-lubricating gears</li> <li>• Safety</li> <li>• Suitability for production methods</li> <li>• Function of component parts</li> <li>• Aesthetic properties</li> <li>• Ease of cleaning</li> <li>• Re-cycling</li> <li>• Any other suitable statement.</li> </ul> <p><b>Sample answers</b></p> <p><i>ABS offers excellent strength to weight ratio and has a high impact resistance. (2 marks)</i></p> <p><i>Nylon gears and fasteners are extremely hard-wearing and self-lubricating. (2 marks)</i></p> <p><i>Stainless Steel blades are durable, non-corrosive and aesthetically pleasing. (3 marks)</i></p> <p><b>NB – mention of mass production can be awarded in (1b) only six valid statements @ 1 mark each No mark awarded for repetition</b></p>	6	

Question		Expected Answer(s)	Max Mark	Additional Guidance
1	(c)	<p><b>Suitable Processes.</b>            Bladeless Fan – Extrusion, Injection Moulding            Pedestal Fan – Welding, Press Forming, CNC Machining, Bending/forming, Extrusion, Piercing, Blanking, Plastic dip/powder coating, Electro plating.</p> <ul style="list-style-type: none"> <li>• How manufacturing/assembly techniques are influenced by volume of production.</li> </ul> <p><b>Statements could include:</b>            Standardisation of sizes, component parts all the same size. No further finishing required. Shapes suitable for process.            Standardisation of components and materials chosen because they are easily sourced/formed.            Suitable for mass/batch production – injection moulding.            Economy of scale – mass/continuous production/JIT.</p> <p><b>Maximum of 3 for identification of processes. (1 each process)</b>  <b>Maximum of 3 marks per process (1 identification, 2 justification)</b></p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Comments Accept            Manufacture - Quality of standard components            Consumer – High quality finish</p> </div>	6	<p>No marks can be awarded for generic statements about processes eg rotational moulding produces a hollow shape. The processes must be related to the products.</p> <p>Marks can be awarded for a correct justification of an incorrectly identified process</p>

Question		Expected Answer(s)	Max Mark	Additional Guidance
1	(d)	<p><b>Any four identified issues described:</b></p> <ul style="list-style-type: none"> <li>• Fitness for its purpose</li> <li>• Durability to withstand continual use</li> <li>• Noise level</li> <li>• Safety aspects of function</li> <li>• Maintenance issues</li> <li>• Ease of use</li> <li>• Easy to clean</li> <li>• Stability</li> <li>• Portability</li> <li>• Remote Control (Bladeless fan)</li> <li>• Any other acceptable issue.</li> </ul> <p><b>Four issues identified, 4 issues @ 1 mark each (3+1)</b></p>	4	
1	(e)	<p><b>Any description from:</b></p> <ul style="list-style-type: none"> <li>• Cost (if compared or market identified)</li> <li>• Aesthetics</li> <li>• Durability</li> <li>• Brand name/image/prestige</li> <li>• Recycling</li> <li>• Easy to use/store</li> <li>• Lightweight (if related to portability)</li> <li>• Functionality (variable speed etc)</li> <li>• Remote Control (Bladeless fan)</li> <li>• Adjustable height (Pedestal fan)</li> <li>• Safe to use (Bladeless fan)</li> <li>• Any other acceptable answer.</li> </ul> <p><b>4 issues described @ 1 mark each (3+1)</b>  <b>No marks awarded for repetition from 1(d)</b></p> <div style="border: 1px solid black; padding: 5px; width: fit-content;"> Comments Accept </div>	4	

Question		Expected Answer(s)	Max Mark	Additional Guidance
1	(f)	<p><b>Any four issues explained in the context of production or use:</b></p> <ul style="list-style-type: none"> <li>• Chemical waste as a by-product from manufacturing processes</li> <li>• Recycling/disposal</li> <li>• Power consumption (efficiency rating)</li> <li>• Planned obsolescence</li> <li>• Health &amp; Safety of the user (Spinning blades/mains powered)</li> <li>• Sustainability issues</li> <li>• Health &amp; Safety (Manufacturer – training/legislation)</li> <li>• Transport (JIT/smaller packages etc)</li> <li>• Any other acceptable issue.</li> </ul> <p><b>4 issues @ 1 mark each 1 mark can be awarded if a range of issues are identified but not described.</b></p> <p><b>No marks awarded for repetition from 1(e)</b></p>	4	
<b>Total for Section A</b>			<b>30</b>	

**SECTION B**

Question		Expected Answer(s)	Max Mark	Additional Guidance
2	(a)	<p>Extrusion is the only acceptable answer (for 1 mark)</p> <p><b>Any suitable justification relating to the process:</b></p> <ul style="list-style-type: none"> <li>• Uniform cross-section</li> <li>• Suitability of material</li> <li>• Length of product</li> <li>• Accuracy</li> <li>• Repeatability</li> <li>• Any other acceptable answer.</li> </ul> <p><b>2 @ 1 mark each</b></p>	2	
2	(b)	<p><b>Any three descriptions which include:</b></p> <ul style="list-style-type: none"> <li>• Material properties altered to suit product function</li> <li>• Increased durability</li> <li>• Increased strength to weight ratio</li> <li>• Low density (to suit the product)</li> <li>• High tensile strength</li> <li>• Improved resistance to wear and tear</li> <li>• Improved stiffness/flexibility (with reasoned answer)</li> <li>• Any other suitable answer.</li> </ul> <p><b>3 @ 1 mark each</b> <b>Answers MUST be descriptions</b></p>	3  (5)	



Question		Expected Answer(s)	Max Mark	Additional Guidance
3	(a)	<p><i>“Technology transfer is where technology has been modified and successfully used in a new situation.”</i></p> <p><b>One mark for correct description.</b></p>	1	
3	(b)	<p><b>Any suitable statements:</b></p> <ul style="list-style-type: none"> <li>• Strength to weight ratio</li> <li>• Lightweight (easy to manipulate/lift etc)</li> <li>• Non-corrosive</li> <li>• Suitable for manufacturing techniques</li> <li>• Elasticity (die cast process)</li> <li>• Durability.</li> </ul> <p><b>2 @ 1 mark each</b></p>	2	
3	(c)	<p><b>One mark for each appropriate explanation:</b></p> <ul style="list-style-type: none"> <li>• Non-slip feet</li> <li>• Secure locking mechanism</li> <li>• Easily carried</li> <li>• No kinks in structure</li> <li>• Clear labelling (Conditions of Use)</li> <li>• Lightweight for transportation</li> <li>• Wide base for stability</li> <li>• Close fitting when closed to avoid finger traps.</li> <li>• Any other appropriate answer.</li> </ul> <p><b>3 @ 1 mark each</b> <b>No repetition from (b)</b></p>	3  <b>(6)</b>	

Question			Expected Answer(s)	Max Mark	Additional Guidance
4	(a)		<p><b>Any two explanations covering the following aspects:</b></p> <ul style="list-style-type: none"> <li>• Reduces lead time</li> <li>• More economical</li> <li>• Cheaper to modify</li> <li>• Safety issues</li> <li>• Easier to modify</li> <li>• Testing</li> <li>• Client presentations/promotional/overall aesthetic of product</li> <li>• Any other suitable answer.</li> </ul> <p><b>2 marks @ 1</b> <b>Answers MUST be explanations</b></p>	2	
4	(b)	(i)	<p>A <b>prototype</b> is a fully functioning product built to test a concept or process. It is an exact replica of the proposed commercially produced product/component.</p> <p><b>1 mark</b></p>	1	
4	(b)	(ii)	<p><b>Any three aspects explained:</b></p> <ul style="list-style-type: none"> <li>• Engine efficiency/durability/noise/safety</li> <li>• Passenger evacuation/comfort/seating</li> <li>• Aircraft handling/vibration/take off/landing</li> <li>• Stress analysis on aircraft body/windows/landing gear (cracks etc)</li> <li>• Braking</li> <li>• Any other relevant answer.</li> </ul> <p><b>3 marks @ 1</b></p>	3	

Question			Expected Answer(s)	Max Mark	Additional Guidance
4	(b)	(iii)	<p><b>Any three aspects described:</b></p> <p>User Trials</p> <ul style="list-style-type: none"> <li>• Hours of flying to check aircraft handling</li> <li>• Timed passenger evacuation test</li> <li>• Testing in poor weather capabilities</li> <li>• Take-off and landing repeatedly</li> <li>• Impact/load testing</li> <li>• Visual checks of aircraft body (durability)</li> <li>• Concept testing on a small market group (cabin features/comfort)</li> </ul> <p>Test Rigs</p> <ul style="list-style-type: none"> <li>• Engine test rigs/destructive testing of engine casing</li> <li>• Braking/landing gear test rigs.</li> <li>• Materials testing (component parts, tyres etc)</li> </ul> <p><b>3 marks @ 1</b></p>	<p><b>3</b></p> <p><b>(9)</b></p>	

Question		Expected Answer(s)	Max Mark	Additional Guidance
5	(a)	<p><b>Any two issues described:</b></p> <ul style="list-style-type: none"> <li>• Relatively inexpensive to hardwoods</li> <li>• Fast growing/plentiful</li> <li>• Locally sourced</li> <li>• Easily worked</li> <li>• Liable to splitting/easier to damage than comparable hardwoods</li> <li>• Knotty appearance/resin pockets</li> <li>• Sustainability</li> <li>• Aesthetic appeal</li> <li>• Protective finish required</li> <li>• Any other suitable answer.</li> </ul> <p><b>2 @ 1 mark</b></p>	2	
5	(b)	<p><b>Any of the following explanations must include:</b></p> <ul style="list-style-type: none"> <li>• Consistency of product profile/ reduced human error</li> <li>• Speed of production</li> <li>• Accuracy of product</li> <li>• Flexibility of design/production</li> <li>• Low cost/efficiency</li> <li>• Semi-skilled labour</li> <li>• Reduced labour force</li> <li>• Any other suitable answer.</li> </ul> <p><b>2 @ 1 mark</b> <b>Answers MUST be explanations</b></p>	2	
5	(c)	<p><b>Any two issues described:</b></p> <ul style="list-style-type: none"> <li>• Variable number of items produced</li> <li>• Flexibility of machinery (Multipurpose)</li> <li>• Easily managed production</li> <li>• Less storage required</li> <li>• Less capital tied up in stock/produced to satisfy orders</li> <li>• Flexibility in terms of product rather than design</li> <li>• Tooling issues</li> <li>• Any other suitable answer.</li> </ul> <p><b>2 @ 1 mark</b></p>	2  <b>(6)</b>	

Question		Expected Answer(s)	Max Mark	Additional Guidance
6	(a)	<p><b>Any appropriate physiological aspects described:</b></p> <ul style="list-style-type: none"> <li>• Portability</li> <li>• Manoeuvrability</li> <li>• Easy to push/weight of product</li> <li>• Ease of assembly/collapse</li> <li>• Security of the child (re fastening/unfastening clasp, etc.)</li> <li>• To ensure the comfort of child</li> <li>• Applying/releasing braking mechanism</li> <li>• Any other suitable answer.</li> </ul> <p><b>4 @ 1 mark</b></p>	4	
6	(b)	<p><b>Any two issues explained:</b></p> <ul style="list-style-type: none"> <li>• Targeting specific niche (eg families with two young children)</li> <li>• Single unit more economical than buying two buggies</li> <li>• Less storage space required than 2 buggies</li> <li>• Easier to transport two children</li> <li>• One person operation</li> <li>• Greater stability due to increased wheelbase.</li> <li>• Social benefits for children</li> <li>• Or any other suitable answer.</li> </ul> <p><b>2 @ 1 mark</b></p>	2	
6	(c)	<p><b>Any three issues explained:</b></p> <ul style="list-style-type: none"> <li>• Increased sales/exploit market</li> <li>• Increased marketing opportunities</li> <li>• Brand image (reputation)</li> <li>• Minimal additional tooling</li> <li>• Material sources already established</li> <li>• Standard components</li> <li>• Minimal need of further staff training</li> <li>• Product testing already complete/BSI standards</li> <li>• IPR already established</li> <li>• Any other appropriate answer.</li> </ul> <p><b>3 @ 1 mark</b></p>	3  <b>(9)</b>	

Question		Expected Answer(s)	Max Mark	Additional Guidance
7		<p><b>Any of the following aspects correctly described:</b></p> <ul style="list-style-type: none"> <li>• <b>Trademark</b> –used to protect the name, logo/identity of the product</li> <li>• <b>Copyright</b> – used to protect the software used to operate the product/protect advertising videos/images/slogans</li> <li>• <b>Patent</b> – used to protect how the product operates (touch screen, charging methods, fitting of blocks etc)</li> <li>• <b>Registered Design/Design Rights</b> – used to protect the aesthetic shape/form of the product</li> <li>• <b>Confidentiality</b> – secrecy of recipe, etc.</li> </ul> <p><b>No marks for simply naming IPR method. (Max 2 marks for each full description)</b></p>	<p><b>5</b></p> <p><b>(5)</b></p>	
<b>Total for Section B</b>			<b>40</b>	

[END OF MARKING INSTRUCTIONS]