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RECOGNISING ACHIEVEMENT

GCE

Design and Technology

Advanced GCE **2524/01**

Unit 7: Product Design 2

Mark Scheme for June 2010

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1 Fig 1 shows a chair made from softwood.

(a) (i) Name <u>two</u> specific softwoods that are suitable for the manufacture of the chair.

- Scots Pine
- Parana Pine
- Spruce
- Yellow Cedar.

2 x 1 mark [2]

(ii) State <u>two</u> methods of attaching the slats of the seat to the frame.

- Counter- sunk or counter bored screws
- Counter bored bolts
- Dowel pegs.

2 x 1 mark [2]

(iii) Describe <u>two</u> ways the chair has been strengthened by its design. Use sketches where appropriate.

<u>One</u> mark for appropriate method <u>one</u> mark each for description of valid method.

- Brackets supporting the arms
- Use of slats acting as stretchers
- Back support leg.

2 x 2 mark [4]

(b) Describe how the side frames of the chair could be manufactured in quantity. Use sketches where appropriate.

Eight suitable points raised that would enable accurate repetitive assemble.

- Jigs for assembly
- Pre manufactured parts or made as part of manufacture
- Indication that there are left and right handed frames
- Accurate cutting of joints
- Accurate drilling
- Use of suitable adhesives
- Clamping
- Suitable adhesives
- Curing times.

8 x 1 mark [8]

(c) Discuss the issues involved in the use of softwood to produce furniture.

Possibility for managed forest

Planed timber is machined smooth for final cleaning up. Softwood other than western red cedar may deteriorate extremely quickly if used out-doors and must be protected with preservative fluids or paints

Planed softwoods need protection against becoming ingrained with dirt

Many softwoods have a high resin content

Large knots can cause difficulty during manufacture

Splits in the ends of boards are quite common and allowance should large jobs, at least 5-10% waste is allowed to cover these faults.

Points raised (3)
Explanations (3)
Examples given (2)

[8]

Total: [24]

2 Fig 2 shows a die cast toy car

(a) (i) Name <u>two</u> alloys that are commonly used in die-casting.

- Zinc alloy
- Aluminium Alloy
- Copper Alloy
- Magnesium Alloy
- Lead/Tin Alloy.

2 x 1 mark [2]

(ii) Give <u>four</u> reasons why die-casting is used for this type of toy car.

eg

- Die casting produces stronger parts with closer tolerances that have greater stability and durability.
- Die cast parts have greater resistance to temperature extremes
- Die casting produces parts with thinner walls, closer dimensional limits and smoother surfaces.
- Production is faster and labour costs per casting are lower.
- Finishing costs are less
- Little or no machining is required and thousands of identical castings can be produced before additional tooling is required.

4 x 1 mark [4]

(iii) State <u>two</u> finishes that can be applied to the body of the toy car.

- Applied transfers
- Dip Painting
- Spray painting.

2 x 1 mark [2]

(b) (i) Describe the die-casting process. Use sketches where appropriate.

The chassis of the car is attached to the by riveting.

Hot chamber machines are used primarily for zinc, copper, magnesium, lead and other low melting point alloys that do not readily attack and erode metal pots, cylinders and plungers. The injection mechanism of a hot chamber machine is immersed in the molten metal bath of a metal holding furnace. The furnace is attached to the machine by a metal feed system called a gooseneck. As the injection cylinder plunger rises, a port in the injection cylinder opens, allowing molten metal to fill the cylinder. As the plunger moves downward it seals the port and forces molten metal through the gooseneck and nozzle into the die cavity. After the metal has solidified in the die cavity, the plunger is withdrawn, the die opens and the casting is ejected.

Cold chamber machines are used for alloys such as aluminium and other alloys with high melting points. The molten metal is poured into a "cold chamber," or cylindrical sleeve, manually by a hand ladle or by an automatic ladle. A hydraulically operated plunger seals the cold chamber port and forces metal into the locked die at high pressure.

4 x 1 mark [4]

(ii) Describe the riveting process. Use sketches where appropriate.

Description of suitable riveting process any <u>four</u> valid points raised or <u>two</u> points fully described with diagrams

- Formation of thin end to pillar
- Hole of based inserted over pillar
- Shape of forming tool
- Pressure applied to form dome of rivet
- Work hardened.

4 x 1 mark [4]

(c) Discuss the health and safety implications for the surface finished of toys.

- Toxicity of finish to users (lead based paints)
- Dangers to employees fume extraction etc
- Flaking finishes.

Points raised (3)
Explanations (3)
Examples given (2

[8]

Total: [24]

3 Fig. 3 shows a mobile phone.

(a) (i) Name <u>two</u> specific plastics suitable for the outer casting of the mobile phone.

- ABS
- HDPE
- HIPS.

2 x 1 mark [2]

(ii) Identify <u>one</u> way anthropometric data has been considered in the design of the phone. Use sketches where appropriate.

- Size of buttons to size of fingers
- Distance of earpiece to mouthpiece to ears/mouth.

Description linked to human measurements

2 x 1 mark [2]

(iii) Describe <u>two</u> fixing methods that can be used to assemble the two halves of an injection moulded plastic case. Use sketches where appropriate.

- Security machine screws
- Self taping screws
- Thermo-welded joint (if permanent joint)

2 x 2 mark [4]

(b) Plastic cases are often produced by injection moulding using a split-die.

(i) Describe the features of a split-die. Use sketches where appropriate.

- Injection hole
- Split Die
- Ejection pins
- Air vent
- Chamber.

4 x 1 mark [4]

(ii) Description of how efficiency is achieved during the injection moulding process. Any four valid points.

- Continuous flow of material (pellets)
- Heating elements over pressure chamber
- Material only plasticised
- Cooling jackets around die
- Short delay times at end of cycle.

4 x 1 mark [4]

(c) Discussion associated with rapidly changing technological advances in portable electronic equipment.

- Rapid change
- Consumer demand for the latest gadgets
- Issues involved with miniaturisation
- More technology could be over stretching battery life.

Points raised (3)
Explanations (3)
Examples given (2)

[8]

Total: [24]

4 Fig. 4 shows a coloured four-folded advertising leaflet printed on gloss paper.

(a) (i) Name <u>two</u> specific printed methods suitable for printing large runs of coloured leaflets.

- Off-set litho
- Gravure
- Letter Press

2 x 1 mark [2]

(ii) Give <u>two</u> reasons for producing leaflets in a folded form.

eg
- Smaller footprint when printed
- Easier to post than large sheet
- Large images can be spread over several pages if needed.

2 x 1 mark [2]

(iii) Composite images incorporating text, graphics and photographs can be digitised for use in CAD.

Describe <u>two</u> stages in preparing a composite image before the printing process.

- Digitised tablet
- Suitable graphics software
- Digital camera to import images.

1 mark for method
1 mark for description

2 x 2 mark [4]

(b) Fig. 5 shows a holder made from board used to dispense the leaflets. The net of the holder is in one piece. Draw a suitable net for the holder that would enable it to be assembled from a flat form. Include cut and fold details.

- Net will work
- Correct proportions
- Fold lines vertical and horizontal
- Cut lines
- Slots for back legs
- Two parts shown as one unit
- Support legs shown
- Front cut away shown
- Difference in width between holder section and back board.

Diagram to be supplied with final marks scheme

8 x 1 mark [8]

(c) Discuss the environmental issues associated with waste products produced by the printing industry.

- Safe disposal of waste ink
- Confidential waste issues
- Avoiding use of plastic covers bindings
- Glues used for binding
- Vegetable based inks
- General waste for disposal or recycle.

Points raised (3)
Explanations (3)
Examples given (2)

[8]

Total: [24]

5 Fig 6 shows a drinks carrier given to customers by a fast food restaurant.

(a) (i) State <u>two</u> reasons why these drinks carriers would be distributed to a restaurant in a flat form.

- Easy to transport
- Easy to store on site
- Less risk of damage before use.

2 x 1 mark [2]

(ii) The drinks carrier is made from corrugated boards. Give <u>two</u> reasons why this material is suitable for this type of carrier.

- Low cost unbleached board used
- Good strength to weight properties
- Easily formed shapes can be obtained from flat boards.

2 x 1 mark [2]

(iii) Describe <u>two</u> ways how the carrier has been strengthened by its design. Use sketches where appropriate.

- Double folds where extra loading occurs (handle)
- Use of radial cuts where stress points occur
- Base reinforced.

2 x 2 mark [4]

(b) Describe how the drinks carrier would be designed so that it would lock together when assembled at the point of sale. Use sketches where appropriate.

- Correct net
- Fold lines correctly shown
- Carrier will fold flat
- Carrier will hold four drinks
- Slide locking mechanism shown
- Handle wrap.

Diagrams to be supplied with final mark scheme

8 x 1 mark [8]

(c) Discuss the issues for manufacturers when considering volume production.

- Consistency of materials checking
- Constant monitoring of running equipment at full speed
- Planned rotational maintenance of machinery to limit down time.

Points raised (3)
Explanations (3)
Examples given (2)

[8]

6 Fig 7 shows a child's pyjama set with a logo.

(a) (i) The logo has been transfer printed onto the pyjamas. Name <u>one</u> alternative method that could be used to add the logo.

Any one, one mark:

- Screen print
- Appliqué
- Free machine embroidery
- Computer controlled stitching.

[1]

(ii) Name <u>one</u> seam that could be used in the construction of pyjama set, giving <u>two</u> reasons for your choice.

One mark for the seam, one for each reason up to two marks:

- Double stitched – flat so comfortable, strong, no neatening needed, decorative
- French – quite flat so comfortable, all edges enclosed so strong, no neatening needed
- Plain seam – easy to do, suitable for any fabric, can be let out if child grows
- Overlocked – quick to do, stitches and neatens and trims in one action, strong.

[3]

(iii) Give <u>two</u> finishes that could be applied to the pyjama set fabric, stating how each would improve the performance of the product.

One mark for the finish, one for the benefit, two needed:

- Brushing – adds warmth, imrpoves texture
- Flame retardant – safety and prolongs product life
- Stain resistant – easy to clean, reduces washing needed
- Easy care – easy to wash
- Hygienic – prevents action of bacteria – healthy/no smell.

[4]

(b) Describe the industrial method of transfer printing the logo onto the pyjama set.

Use sketches where appropriate.

Any eight in a logical order:

- Produce design and reverse it – CAD can be used
- Print onto special paper – transfer printing paper
- Use of special inks/dyestuffs
- Works best on synthetic fibres/fabrics
- Paper must be in close contact with the fabric
- Place paper dye/ink side next to right side of fabric
- Heated calender used to roll over the paper with the fabric beneath it
- Dyestuffs become a vapour (Sublime)
- As paper close to fabric, dye diffuses into the fibres of the fabric and stay there
- Set in place by heat
- Paper and fabric need to be flat to ensure design is accurately printed.

[8]

(c) Discuss the implications for a manufacturer of using a JIT production system.

Discussion could include reference to:

- Reduces storage space needed for raw materials, reducing costs
- Reduces money tied up in stock
- Reduces levels of finished stock held, reducing money tied up
- Allows for quick response to orders
- Allows for frequent style and colour changes
- A systems approach to all the processes
- Increases productivity
- Rely on suppliers to deliver on time – if late could hold up production
- Faulty raw materials could hold up production
- ICT helps system to function – need to know exactly what is in stock at all times
- Reduces lead up times and set up times.

Range and relevance of issues relating to the question [3]
Quality of the reasoning and explanation [3]
Suitable use of examples and evidence to support the discussion [2]

[8]

Total: [24]

7 Fig. 8 shows a wardrobe consisting of a tubular steel inner frame.

(a) (i) Give <u>four</u> performance characteristics needed by a fabric used for the cover of the wardrobe.

Any four, one mark each:

- Tough/durable
- Wipe clean/easy clean/washable
- Lightweight
- Not permeable to dust
- Moth/rot proof
- Not damaged by sunlight
- Smooth – not snag clothes
- Not build up static electricity
- Stable fabric – not stretchy or will pull out of shape.

[4]

(ii) Give <u>two</u> reasons why the edges of the fabric used to make the cover of the wardrobe have been finished with bias binding.

Any two, one mark each:

- Attractive/design feature/improves appearance
- Prevents fraying
- Strengthens edges of fabric.

[4]

(iii) Describe <u>one</u> method of securing the fabric cover to the tubular frame.

One for a detailed description, possibly with a diagram, one if shallow:

- Ties made from ribbon or braid inserted into the seam at the corners to tie round inner frame
- Velro inserted into the seam at the corners to fasten round inner frame
- Loops from ribbon or braid inserted into the seam at the corners to thread frame through when assembled
- Tubes made from fabric attached at the corners to thread frame through when assembled
- Ties made from ribbon or braid with popper/press stud on the end inserted into the seam at the corners to wrap round inner frame and fasten.

[2]

(b) Describe the order of manufacture of the fabric cover for the wardrobe. Use sketches where appropriate.

Any eight points in a logical order:

- Correct shaped pattern pieces shown
- Markings shown on pattern pieces, eg straight grain, notched, names and number to cut
- Pin on and cut out – mention of aligning straight grain
- Assembled wrong sides together – seams on outside
- Attach clear panels to main fabric
- Neaten front opening edges with bias binding
- Insert zips and fasten to make front one section
- Join front, back and side sections
- Apply bias binding
- Attach top and bottom
- Apply bias binding
- Quality checks.

[8]

(c) Discuss the moral implications associated with the mass production of textile items.

Discussion could include reference to:

- Energy used – heat light, machinery
- Use renewable energy
- Reduce energy consumption – more efficient machines, better insulation etc
- Water consumption and pollution – control
- Transport costs, raw materials in and finished good out – reduce
- Pollution – reduce – heat, light, noise, chemicals
- Consumption of materials – try to use sustainable materials/recyclable
- Packaging
- Disposal of items at end of useful life.

Range and relevance of issues relating to the question [3]
Quality of the reasoning and explanation [3]
Suitable use of examples and evidence to support the discussion [2]

[8]

Total: [24]

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1 Hills Road
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CB1 2EU

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