Design & Technology
(Product Design)

DTBase©

OCR A-Level

CAD & CAM in Final Prototypes (7.2c)

Materials required for questions

- Pencil
- Rubber
- Calculator

Instructions

- Use black ink or ball-point pen
- Try answer all questions
- Use the space provided to answer questions
- Calculators can be used if necessary
- For the multiple choice questions, circle your answer

Advice

- Marks for each question are in brackets
- Read each question fully
- Try to answer every question
- Don’t spend too much time on one question

Good luck!

Q1. CAD stands for?

A Computing and design

B Computer-aided diagram

C Computer-aided design

Q2. CAM stands for?

A Computer-aided manufacture

B Computer-aided making

C Computer-aided modelling

Q3. What is prototype?

A A scaled-down model of a product

B A non-working model of the product

C A working model of a product made to test before production

Q4. What is 3D printing a type of?

A Computer-aided manufacture

B Computer-aided design

C Isometric drawing

Q5. Computer aided design (CAD) can be used to create 3D 'virtual' models. Outline four advantages of using a 'virtual' model as part of the design development process. **(4 marks)**

Q6. What are the advantages of using Computer Aided Design (CAD) to develop your idea. **(4 marks)**

Q7. Explain three benefits of using rapid prototyping using CAD/CAM as an alternative method to block modelling. **(6 marks)**

Q8. Discuss the advantages and disadvantages of using CAD for virtual modelling and testing designs **(6 marks)**

Answers

Q1. C
Q2. A
Q3. C
Q4. A

Q5.

- The models can be manipulated/changed/edited quickly (1)
- The costs involved are relatively low compared to a physical model (1)
- The models can be distributed electronically e.g. to e-mail/to CNC machine / to RPT machine (1)
- The models can be stored electronically (1)
- Virtual testing/simulation is possible (1)
- They can be used to produce photorealistic/realistic images (1)
- Relatively quick to produce (1)
- Viewable from a range of angles/manoeuvrable image (1)
- Models can be replicated easily/giving multiple options (1) Do NOT award a mark for more accurate/accuracy

Q6.

- Easy to edit and change a design in response to feedback
- View the product virtually in 3D. Can rotate image to see from different angles. Can see how the product could go together (parts)
- Able to generate a working drawing from a CAD image
- Able to render and finish a product virtually to see what it would look like in real life.
- Virtual testing of materials and components.
- Ability to share and email designs with third parties instantly

CAD drawing can be sent directly to CAM machine to improve speed, accuracy or manufacture etc. Reference to QC possible.

Q7.

- RPT can be done extremely quickly compared to traditional methods (1) therefore saving lead time/money (1)

- RPT models can be made extremely accurately (1) with out the need for highly skilled craftsmen (1)
- RPT models can be made as hollow formings (1) due to tool-less technology (1)
- RPT models can be made with intricate detail (1) allowing more realistic prototypes to be produced (1)

Q8.

Advantages

- Can test weights/destructive testing (1)
- Can simulate production times (1)
- Calculate material costs (1)
- Files can be transferred electronically (1)
- Ideas easily edited/amended (1)
- Library of standard components/stock size materials (1)
- Anthropometrics/Ergonomic data accessed via databases (1)
- Can be output to 3D printing (1)
- Can view design from all angles (1)
- Colours and textures can be changed easily (1)
- Easily dimensioned for cutting lists (1)
- No need to purchase modelling materials (1)
- Reduced demand on resistant / compliant materials for modelling (1)

Disadvantages

- High cost/expensive set up (1)
- Highly skilled operative required / training issues (1)
- Power-cuts can lose work/loss of files if not backed up (1)
- Unable to physically test until prototype is produced (1)
- Continual development/upgrade of software/hardware required (1)
- Potential threat of hacking / cyber theft / ransom (1) If the answer only includes advantages or only includes disadvantages, a maximum of four marks will awarded