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MARKSCHEME

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DESIGN TECHNOLOGY

Standard Level

Paper 2

11 pages

SECTION A

1. (a) (i) *Award **[1]** for tile 4*

(ii) *Award **[1]** for a design context where noise reduction is an important consideration, e.g. blocks of flats, office blocks, factories, etc.*

(b) (i) *Award **[1]** for correct answer of* 0.5625 m^2 or 562500 mm^2
0.75 m × 0.75 m
750 mm × 750 mm

(ii) *Award **[1]** for reading the mass per unit area from the table and recognising that it is mass/unit area.*
*Award **[1]** for calculating the area and multiplying by the mass per unit area and by 25.*
*Award **[1]** for the correct answer.*

N.B. ***[0]*** *for 2.98 × 25*

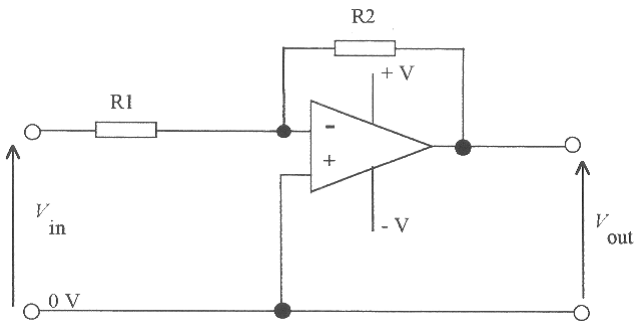
(c) *Award **[2]** for an explanation of each factor up to a maximum of **[4]**.*
[1] for the factor and ***[1]*** for explanation.

- resistance to greasy conditions because of frying with oil/fat
- resistance to damp conditions because steam will be produced by boiling water and will condense on cool surfaces
- non-flammable (or statement about resistance to fire)
- reduce noise
- ventilation must be considered
- easily cleaned or replaced if unclean able
- non-crumble (or a statement saying that bits must not drop into food.)
- chemically inert
- non-toxic
- colour
- thermal expansion

2. *Award **[1]** for stating what – i.e. that the requirement is for high stiffness not floppy wing.*
*Award **[1]** for pointing out why – i.e. that if the wing is not stiff then the glider will not fly or steer properly.*

3. (a) *Award **[1]** for description of a digital signal (an encoded or binary signal, 0 or 1). Award **[1]** for description of an analogue signal (a signal that may change continuously to represent a physical property).*

(b) *Award **[1]** for inserting the resistor R2 and **[1]** for connecting the +ve input of the op- amp to the 0 V line.*



*Award a further **[1]** for the value of* R2 (feedback resistor) of 270 kΩ derived from substitution in the formula $\text{Gain} = \frac{-\text{R2}}{\text{R1}}$ where gain is calculated from the relationship of input to output voltages given. *Award **[1]** for doing the calculation correctly.*

4. *Award **[1]** for each advantage stated to **[2]** maximum.*

- parts can be made the same
- process can be speeded up
- operator fatigue is reduced
- quality control is easier
- less skill is required
- parts are made more accurately

SECTION B

5. (a) Award ***[1]*** for explaining that the thief breaks the circuit in stealing clothes and ***[1]*** for stating that as a result the circuit will then generate a loud noise from the loudspeaker.

(b) (i) Loudspeaker ***[1]***

(ii) OR or NOR

00 0	00 1
01 1	01 0
10 1	10 0
11 1	11 0

(c) *Award **[1]** for each correct answer below; up to **[3]** maximum.*

INPUT	PROCESS	OUTPUT
Normally closed switches Fixed Resistor Noise Generator	Logic gate (component X) Power amplifier	Loudspeaker (Component R)

(d) The shopkeeper requires that the goods are displayed and accessible but also protected from theft ***[1]***. The customer needs to be able to browse the stock ***[1]*** and not be intimidated by overly oppressive security measures such as surveillance and tagging ***[1]***. The designers job is to reconcile the needs of the shopkeeper with the expectations of the customers ***[1]*** and to ensure that the system is very visible to the customer ***[1]*** without affecting the way they can view the clothes ***[1]***. The system should be strong enough so that it does not go off with reasonable moving of clothes ***[1]***.

*(Plus up to **[3]** for quality)*

6. (a) (i) *Award **[1]** for "The use of a matrix or vessel in which fluid or plastic material is formed into shape."*

(ii) *Award **[1]** for each material correctly identified up to **[2]** maximum.*

- plastics (polymers) or any named polymer *e.g.* polystyrene, polypropylene
- metals
- concrete (in its uncured state)
- ceramics (prior to firing or sintering)
- composites (GRP, *etc*.)
- timber
- food

(b) (i) *Award up to **[2]** for stating that the designer can influence the product life cycle by:*

- designer produces design solution *i.e.* selects appropriate materials ***[1]***
- designer consults with production team and influences manufacturing processes ***[1]***
- designer gets feedback on commercial success (redesign aspect) ***[1]***
- designer can design in planned obsolescence ***[1]***
- designer influences recycling potential ***[1]***

(ii) Part B requires less work done on it ***[1]*** and can therefore reduce the number of workers required ***[1]*** and thus manufacturing costs ***[1]***. If components fail in a way which can be predicted by the manufacturer then the manufacturer can achieve planned obsolescence ***[1]***. This means that the consumer will have to update the appliance at intervals which will result in continued demand for the later model ***[1]***.

(c) The graph shows that whilst the fixed start up costs for Part B are greater than for Part A ***[1]*** the variable cost per part is considerably less ***[1]***. The break-even point ***[1]*** occurs at exactly 3000 parts ***[1].*** Production less than 3000 would mean that Part A was more cost effective ***[1]*** and for any number greater than 3000 Part B would be better ***[1]***. Start up costs include machining costs ***[1]***. Variable costs include raw materials ***[1]***. (***[8]*** maximum).

*(Plus up to **[3]** for quality)*

7. (a) (i) *Award **[1]** for a statement reproducing the definition:* The working through of ideas or hypotheses (by using materials to construct physical models, or using computers to generate graphical or statistical models).

(ii) Symbolic modelling uses formulae and mathematical computation to assist the design process ***[1]***. Symbolic modelling could help in identifying volume/shape relationships or stress points on the bottle when pressurised by a carbonated liquid ***[1]***.

(b) (i) *Award **[1]** for each element identified from the list below up to **[3]** maximum.*

- three dimensional visualisation of the proposed idea
- volumetric data
- moulding information (where mouldlines could be set *etc*.)
- customer reaction
- labelling information (where the label will go, size, data to be given.
- ergonomic data

(ii) Up to ***[3]*** for explanation:

- the client and other people can handle a solid model ***[1]***
- the model provides tactile information ***[1]***
- the designer can see how it fits into the hand ***[1]***
- it provides a better representation of reality ***[1]***
- the designer does not need a computer to develop the model ***[1]***
- the model can be produced cheaply ***[1]***

(c) *Award **[1]** for each phrase identified from the candidates answer up to **[8]** maximum.*

- used to virtually visualise the proposed design in 3D
- many ideas can be generated from which the client could choose
- linked to symbolic modelling packages, volumetric data could be incorporated with out the need for solid modelling
- 2D sketches can be produced with labels to show variations possible.
- lots of ideas can be generated at a reasonable cost
- client style can be incorporated in the new design
- information can be transmitted by e-mail / Internet to remote clients

*(Plus up to **[3]** for quality)*