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All Examiners are instructed that alternative correct answers and unexpected approaches in candidates’ scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

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Section A

Part A – Product Design

1 (a) description of process
   – fully detailed (3–5)
   – some detail (0–2)
   quality of sketches (up to 2) (7 x 2) [14]

(b) milling
   Angle slot difficult to cut
   Accurate/good finish

   turning
   Very good finish
   Can be bored

   calendering
   Large sheets produced/cut to size
   Even thickness
   (3 x 2) [6]

[Total: 20]

2 (a) appropriate material including:
   Aluminium/mild steel
   acrylic
   hardwood (1)
   Reasons including:
   takes a good finish/easy to form
   easy to clean/attractive (2 x 1) [3]

(b) description to include:
   appropriate method;
   shaping, joining
   bending
   quality of description:
   – fully detailed (3–6)
   – some detail (0–2)
   quality of sketches (up to 2) [8]

(c) explanation could include:
   change in process;
   change in materials;
   use of jigs, formers, moulds;
   simplification of design.
   quality of explanation:
   – logical, structured (4–7)
   – limited detail (0–3)
   quality of sketches (up to 2) [9]

[Total: 20]
3 Discussion could include:

(a) aesthetics
- product attraction
- colour/shape
- fashion trends

examination of issues (4)
quality of explanation (4)
supporting examples/evidence (2) [10]

(b) marketing strategies
- promotion/placement strategies
- target market research
- advertising strategies

examination of issues (4)
quality of explanation (4)
supporting examples/evidence (2) [10]

[Total: 20]

Part B – Practical Design

4 (a) (i) two alloys e.g.
- steel
- brass
- bronze
- duralumin (2 x 1) [2]

(ii) specific materials e.g.
- steel – iron/carbon 0.3–1.2%
- brass – copper 65% zinc 35%
- bronze – copper 90%/tin 10%
- duralumin – aluminium 95%/copper 4%/manganese 1% (2 x 2) [4]

(iii) products (2 x 1)
Explanation (2 x 2) [6]

(b) (i) tensile test described (up to 4)
sketch (1) [5]

(ii) load extension graph described [3]

[Total: 20]
5 (a) (i) ability to be drawn into wire [2]

(ii) e.g. Aluminium
Mild steel
Copper [1]

(iii) description of process
– fully detailed (3–5)
– some detail (0–2)

quality of sketches (up to 2) [7]

(b) understanding of gas welding (2)
understanding of electric welding (2)
comparisons/contrasts (4)
quality of sketches (2) [10]

[Total: 20]

6 (a) (i) total resistance
\[ R = \frac{R_1 \times R_2}{R_1 + R_2} (1) = \frac{36}{12} = 3 \ \Omega \ (1) \] [2]

(ii) current in 1 resistor
\[ V = IR (1) \]
\[ I = 0.5 \ A (1) \] [2]

(iii) current in 6 resistor
\[ I = 0.25 \ A \] [2]

(b) output voltage
\[ V_{out} = \frac{R_1}{R_1 + R_2} \times V (1) = \frac{3}{3 + 6} \times 9 = \frac{27}{9} \ (1) = 3 \ V (1) \] [3]

(c) (i) circuit to include:
relay for motor (1)
thermistor/heat sensor (1)
LED or indicator (1)
Symbols correct (2)
Circuit correct (1) [6]

description to include use of timer circuit
detailed description (3–5)
limited (0–2) [5]

[Total: 20]
Part C – Graphic Products

7 (a) (i) Fruit juice container – card (waxed), polyethylene, aluminium
        Yoghurt pot – PVC (polyvinyl chloride) aluminium top, HIPS (High impact Polystyrene),
        PP (Polypropylene), PET (Polyethylene terephthalate)
        Protective – expanded polystyrene
        Blister pack – card/PE (polyethylene), PVC (polyvinyl chloride), PS (Polystyrene),
        PVDC (polyvinylidene chloride)
        (4 x 1) [4]

(ii) suitability of materials (2 x 3) [6]

(b) discussion could include:
    speed of production
    quality
    rapid change
    issues raised (4)
    quality of discussion (4)
    examples introduced (2) [10]

[Total: 20]

8 (a) correct isometric (2)
     correct assembly (1)
     frame/arcs (3)
     thread (1)
     position (1)
     handle (2)
     quality of linework (2) [12]

(b) correct isometric/exploded (6)
     quality of linework (2) [8]

[Total: 20]

9 (a) design sketches (3)
     Assembly details (2)
     One sheet A4 (2)
     Graphics (1) [8]

(b) clear description of manufacture [4]

(c) explanation could include:
    change in process, press formes etc.;
    use of jigs, formers, moulds;
    simplification of design.
    quality of explanation:
    – logical, structured (4–6)
    – limited detail (0–3)
    quality of sketches (up to 2) [8]

[Total: 20]