



**DESIGN TECHNOLOGY
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PAPER 1**

Thursday 10 May 2001 (afternoon)

1 hour

INSTRUCTIONS TO CANDIDATES

- Do not open this examination paper until instructed to do so.
- Answer all the questions.
- For each question, choose the answer you consider to be the best and indicate your choice on the answer sheet provided.

1. At which stage of the IB simple design loop does divergent thinking predominate?
 - A. Researching and specifying requirements
 - B. Generating ideas
 - C. Developing the chosen solution
 - D. Testing and evaluating the chosen solution

2. The actual process of design is usually more complicated than the IB simple design loop can represent. Which of the following requires a more elaborate design loop?
 - I. Some elements of the design cycle are revisited several times.
 - II. To take advantage of ideas the elements in the design cycle may be visited in a different order.
 - III. The final design is evaluated against the specification and the design improved.
 - A. I and II
 - B. II and III
 - C. I and III
 - D. I, II and III

3. Which of the following statements are **not** true of a physical model of a bridge?
 - I. It looks like the intended outcome.
 - II. It represents the forces acting on the bridge.
 - III. It can be used to calculate safety factors.
 - A. I and II
 - B. I and III
 - C. II and III
 - D. I, II and III

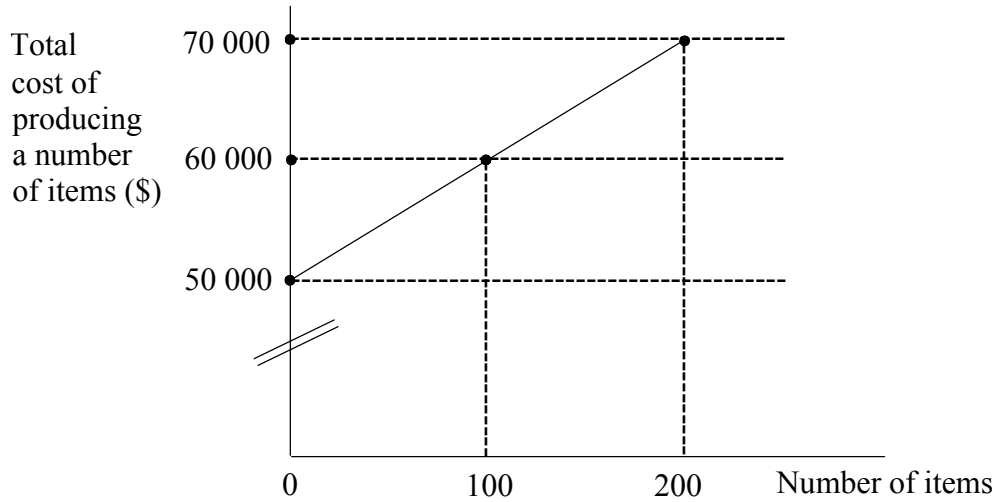
4. Which of the following techniques would be most suitable for design communication between a designer and a manufacturer at the point of going into production?
- A. Process block diagram
 - B. Symbolic model
 - C. Freehand drawing
 - D. Orthographic drawing
5. Which of the following statements are true of the design cycle?
- I. It is controlled by the designer.
 - II. It aims to put a design solution into commercial practice.
 - III. It aims to produce a solution to a problem.
- A. I and II
 - B. II and III
 - C. I and III
 - D. I, II and III
6. Which of the following would be most useful for a designer of novel kitchen appliances who has a range of ideas which need to be assessed in terms of health and safety issues?
- A. Brainstorming
 - B. Expert opinion
 - C. Parts catalogue
 - D. Computer animation
7. Data for which percentile range would be least relevant in the design of a height adjustable ironing board?
- A. 5th percentile
 - B. 50th percentile
 - C. 95th percentile
 - D. 99th percentile

8. In the design and use of disposable plastic carrier bags in a supermarket which of the following modifications will reduce environmental impact?
- I. Increase the thickness of plastic used
 - II. Offer a financial reward for reusing bags
 - III. Reduce the thickness of plastic used
- A. I and II
 - B. I and III
 - C. II and III
 - D. I, II and III
9. A microelectronics company is setting up a fully automated factory in a developing country with no tradition of this industry. Which of the following criteria of appropriate technology would this development achieve?
- I. Employs local workers
 - II. Creates jobs
 - III. Sympathetic to local cultural circumstances
- A. I only
 - B. II only
 - C. III only
 - D. I and II
10. Many materials which can be shaped by casting can be joined by fusing. For which group of materials is this **not** typically true?
- A. Metals
 - B. Ceramics
 - C. Plastics
 - D. Food

11. Which of the following material groups can be subdivided into ferrous or non-ferrous with reference to their magnetic properties?
- A. Metals
 - B. Ceramics
 - C. Composites
 - D. Plastics
12. A mechanical component for a design requires physical properties typical of two different material groups. Redesign can be very costly. Which of the following solutions would it be most appropriate for a designer to evaluate first?
- A. Make two smaller parts, one out of each material
 - B. Use a composite of the two materials
 - C. Use the material which satisfies the most critical requirement
 - D. Redesign the components
13. Which of the following products is manufactured using plastic deformation?
- A. A solid plastic figure
 - B. A circular wooden tabletop
 - C. A ceramic bowl
 - D. A steel door for a car (automobile)
14. Hardness is defined as the ability of a material to
- A. resist penetration or scratching.
 - B. resist the propagation of cracks.
 - C. withstand pulling forces.
 - D. resist deflection or bending.

15. Ancient Chinese artisans were renowned for the quality of their bronze bells and sculptures. Bronze is an alloy of copper and tin. The products were produced by casting. Which of the following steps would **not** have been involved in the production process?
- A. Polishing the product by mild abrasion
 - B. Mixing copper with tin
 - C. Making a mould with appropriate features
 - D. Cutting the bronze to a rough shape
16. Mechanisation is a volume production process involving
- A. computer control.
 - B. a set number of items.
 - C. human control.
 - D. CAD and computer controlled manufacturing systems using the same database.

17.

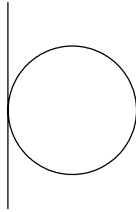


Which of the following statements are true?

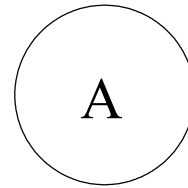
- I. Fixed cost = 50 000 \$
 - II. Variable cost = 6000 \$ per item
 - III. Total cost of producing 200 items = 70 000 \$
- A. I and II
 - B. I and III
 - C. II and III
 - D. I, II and III

18. Which of the following symbols represents an input transducer?

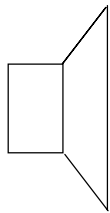
A.



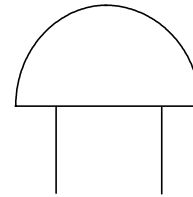
B.



C.



D.

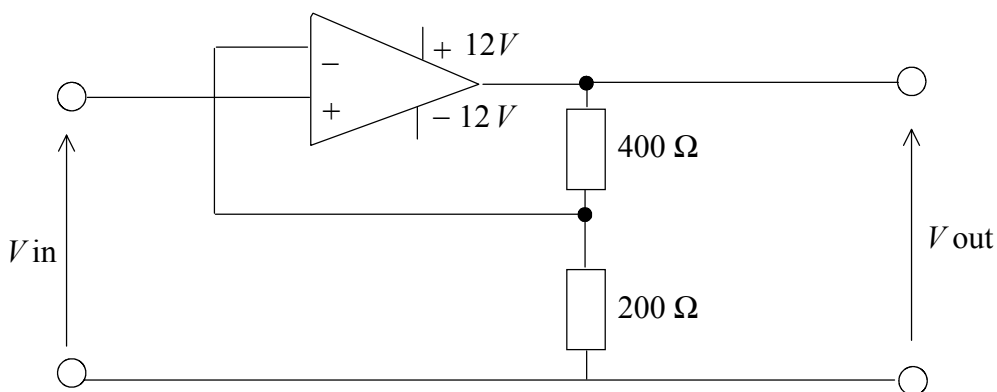


19. Which combination of digital logic gates would give the output Z from the inputs X and Y?

X	Y	Z
0	0	1
0	1	0
1	0	0
1	1	0

- A. AND and NOT
- B. OR and NOT
- C. NAND and NOT
- D. EX-OR and NOT

20.



What is the output voltage for the circuit if the input voltage is 1.2 volts?

- A. 1.2 volts
 - B. 2.4 volts
 - C. 3.6 volts
 - D. 4.8 volts
21. Electrical energy produced from renewable energy sources is sometimes called ‘green’ electricity. Which of the following statements are **not** true?
- I. Green electricity is compatible with electricity from non-renewable sources.
 - II. Use of green electricity is less efficient than use of electricity from non-renewable resources.
 - III. Green electricity production does not involve the production of toxic by-products.
- A. I and II
 - B. I and III
 - C. II and III
 - D. I, II and III

22. Which design decision would **not** improve the efficient use of energy resources by a refrigerator (fridge)?
- A. Increasing the temperature range which the user can select
 - B. Locating the door at the top of the fridge
 - C. Selecting a more energy efficient motor
 - D. Increasing the thickness of insulation
23. Which strategies would enable a power tool designer to obtain information on the size and capacity of different rechargeable batteries?
- I. Brainstorming
 - II. Performance test
 - III. Literature search
- A. I and II
 - B. I and III
 - C. II and III
 - D. I, II and III
24. Which source of power was most important in the Industrial Revolution?
- A. Electricity
 - B. Solar
 - C. Gas
 - D. Steam

25. Which of the following statements is **not** true?
- A. Thermoplastics are more easily recycled than thermosets.
 - B. Thermosets are usually harder than thermoplastics.
 - C. Thermosets cannot be recast into new products.
 - D. Thermoplastics char before melting.
26. Cadmium chloride is used in the production of batteries. A crystal of cadmium chloride shatters under pressure and dissolves in water. The bonding is
- A. covalent.
 - B. ionic.
 - C. secondary.
 - D. metallic.
27. Which statement is **not** true of wood?
- I. Wood is a natural composite.
 - II. Wood is composed of lignin fibres in a cellulose matrix.
 - III. The tensile strength of wood is greater along the grain than across the grain.
- A. I and II
 - B. I and III
 - C. II and III
 - D. I, II and III
28. Diamond and sand are examples of network covalent compounds. Which of the following properties do they have?
- A. Very high tensile strength
 - B. Low electrical resistivity
 - C. Very high thermal conductivity
 - D. High solubility in organic solvents

29. Which of the following is **not** true of weight?
- A. Weight is greater for objects with more matter.
 - B. Weight changes with the distance from the centre of the Earth.
 - C. Weight is measured in grams.
 - D. A meteorite in space can have zero weight.
30. One technique for making more effective and economic use of materials in the construction of a support beam is to
- A. use more material.
 - B. use a hollow shape with less material along the direction of the force.
 - C. use a longer member.
 - D. use a shape with more material along the direction of the force.
31. Mechanical advantage is defined as
- A. the advantage of gears over pulleys.
 - B. the advantage of mechanisation in production.
 - C. load/effort.
 - D. effort/load.
32. Which of the following cannot be used to change the direction of motion?
- A. Fulcrum
 - B. Lever
 - C. Pulley
 - D. Gear

33. A driver gear in a simple two gear mechanism has 100 teeth. The driven gear has 25 teeth. How fast will the driven gear rotate if the driver gear rotates at 100 revolutions per minute (rpm)?
- A. 400 rpm
 - B. 250 rpm
 - C. 100 rpm
 - D. 25 rpm
34. A closed loop circuit is used to position a cutting tool. The cutting tool rapidly approaches the desired position and then oscillates about it. The system is
- A. critically damped.
 - B. over damped.
 - C. undamped.
 - D. under damped.
35. Which of the following should a designer select to produce an output proportional to the sum of two inputs?
- A. An OR gate
 - B. An op-amp circuit
 - C. An AND gate
 - D. A counter
36. Which of the following is **not** a reason to apply a finish to timber?
- A. To modify the appearance
 - B. To protect the wood from moisture and chemicals
 - C. To give a hard coating to protect the surface from wear
 - D. For seasoning

37. Crudely smelted iron, called pig iron, has a high carbon content which makes the iron
- A. extremely malleable.
 - B. extremely strong (high tensile strength).
 - C. extremely hard and brittle.
 - D. extremely high and durable.
38. Which is the most important reason for recycling glass?
- A. To save energy in fusing raw materials
 - B. To save raw materials
 - C. To produce higher quality glass
 - D. To reduce raw material costs
39. The main reason for mixing natural and synthetic fibres in a yarn is to
- A. diversify the investment in raw materials.
 - B. change the characteristics of the yarn.
 - C. minimise the dependence on one supplier.
 - D. increase the recyclability of the yarn.
40. Which of the following characteristics would ensure commercial viability of mycoprotein production?
- I. Cheap substrate
 - II. Non-toxic product
 - III. Easily processed into acceptable food product
- A. I, II and III
 - B. II and III
 - C. I and III
 - D. I and II
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