



**DESIGN TECHNOLOGY
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PAPER 1**

Tuesday 13 November 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. Which of the following models could be most quickly modified?
 - A. An orthographic drawing
 - B. A symbolic model
 - C. A physical scale model
 - D. A computer model

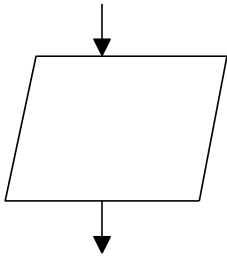
2. In the IB elaborated design loop, planning takes place
 - A. as the solution is being realised.
 - B. throughout the design process.
 - C. after the final solution has been identified.
 - D. as a need is identified and clarified.

3. Which of the following is likely to be used in the early (conceptual) stages of the design process?
 - A. Freehand drawing
 - B. Mock up
 - C. Orthographic drawing
 - D. Processing block diagram

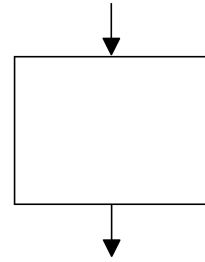
4. Which of the following statements are true?
 - I. CAD can be used to show different views of a component once it has been drawn.
 - II. CAD enables designers to draw complex drawings quickly.
 - III. CAD can be interfaced with other forms of technology.
 - A. I and II
 - B. II and III
 - C. I and III
 - D. I, II and III

5. Which of the following flow chart symbols represents a decision?

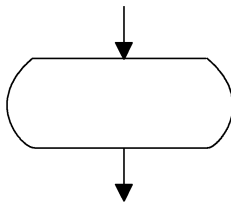
A.



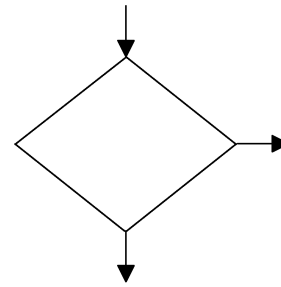
B.



C.



D.



6. An algorithm is

- A. a pictorial representation of a sequence of events.
- B. a sequence of instructions to describe a set of actions.
- C. a physical model.
- D. an algebraic expression.

7. Which statements are directly relevant to planned obsolescence?

- I. The product is designed to last for a specified time.
- II. The product is made from materials that can be recycled.
- III. Low quality materials are used to manufacture the product.

- A. I only
- B. I and II
- C. I and III
- D. I, II and III

8. At which of the following stages in the life of a car, produced using a clean and efficient manufacturing process, would consideration of energy utilisation have the greatest environmental impact?
- A. Manufacture
 - B. Distribution
 - C. Use
 - D. Disposal
9. Recycling always
- I. minimises the depletion of natural resources.
 - II. is cost-effective.
 - III. reduces the amount of solid waste for disposal by landfill or incineration.
- A. I and II
 - B. I and III
 - C. II and III
 - D. I, II and III
10. The protein content of meat is an example of which of the following properties?
- A. Aesthetic properties
 - B. Nutritional properties
 - C. Mechanical properties
 - D. Physical properties
11. Which material group is subdivided with reference to their grain?
- A. Timber
 - B. Metal
 - C. Plastic
 - D. Textile fibre

12. In which units is tensile strength expressed?
- A. kg m^{-3}
 - B. J m^{-2}
 - C. Pa
 - D. $\text{W m}^{-1} \text{K}^{-1}$
13. Which of the following is **least** likely to stimulate the development of new composite materials?
- A. Physical properties
 - B. Mechanical properties
 - C. Aesthetic properties
 - D. Nutritional properties
14. Bending a metal tube to form a frame for a chair is an example of which of the following?
- A. Plastic deformation
 - B. Extrusion
 - C. Sintering
 - D. Casting
15. Which statement best describes hardness?
- A. To resist deflection or bending
 - B. To resist the propagation of cracks
 - C. To resist penetration or scratching
 - D. To withstand pulling forces

16. Which of the following would be produced by one-off production?

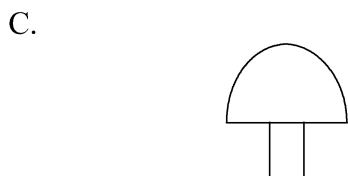
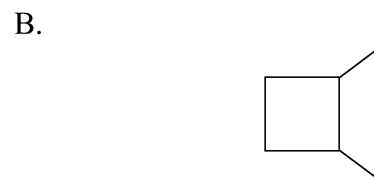
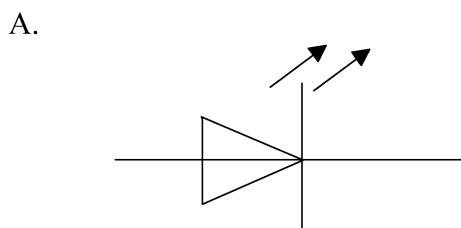
- A. Computer chair
- B. Ceremonial chair
- C. Stadium seating
- D. Flat pack self assembly chair

17. Which of the following would encourage mechanised rather than craft production?

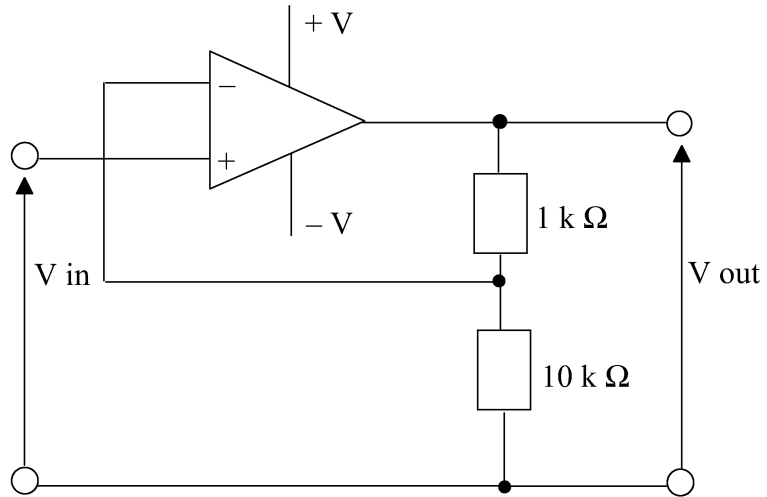
- I. Increased labour costs
- II. Product demand exceeds supply
- III. Introduction of new materials, *e.g.* plastics

- A. I and II
- B. I and III
- C. II and III
- D. I, II and III

18. Which of the following is **not** an output transducer?

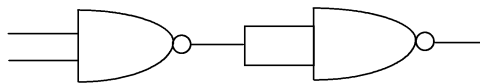


19. What is the gain of the following circuit?

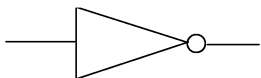


- A. -0.1
- B. -10
- C. 1.1
- D. 11

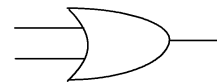
20. Which single digital logic gate is equivalent to the following combination of digital logic gates?



A.



B.



C.



D.



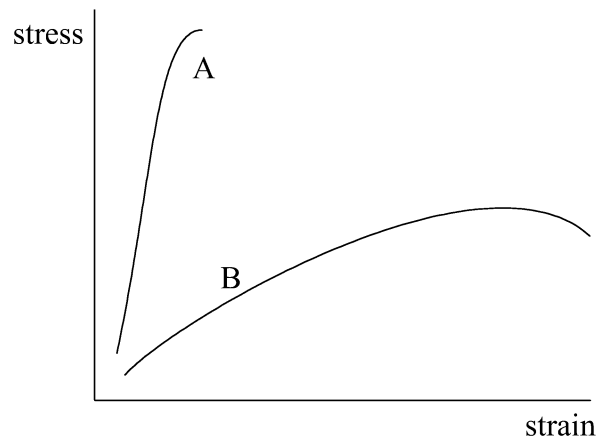
- 21.** Which of the following factors determines whether a reserve is exploited?
- I. The market for the resource
 - II. The technology for exploitation of the reserve
 - III. The availability of the resource
- A. I and II
 - B. I and III
 - C. II and III
 - D. I, II and III
- 22.** Which energy demand causes the most fluctuation?
- A. Heavy industrial use
 - B. Domestic use
 - C. Use in offices and shops open 24 hours per day
 - D. Agricultural use
- 23.** In redesigning a disposable plastic product a designer wants to replace the plastic currently used with a biodegradable alternative. What would be the best way to obtain information on the physical and mechanical properties of potential alternative plastics?
- A. Performance test
 - B. User trial
 - C. Literature search
 - D. Expert appraisal

24. By which technique were most products manufactured prior to the Industrial Revolution?
- A. Automation
 - B. One-off production
 - C. Craft production
 - D. Mechanisation
25. The relative strengths of primary bonds are
- A. ionic > covalent > metallic.
 - B. covalent > metallic > ionic.
 - C. metallic > ionic > covalent.
 - D. ionic > metallic > covalent.
26. Which of the following properties is/are increased by alloying?
- I. Tensile strength
 - II. Hardness
 - III. Malleability
- A. I only
 - B. II only
 - C. III only
 - D. I and II
27. Which of the following is **not** a composite material?
- A. A high temperature superconductor
 - B. Papier mâché
 - C. Mild steel
 - D. Glass reinforced plastic

28. Which is defined as a substance formed by combination of elements in fixed proportions?

- A. Alloy
- B. Mixture
- C. Composite
- D. Compound

29. The graph below shows the stress-strain curves for two materials A and B. In selecting material B in preference to material A, which property combination is the designer selecting?



	Tensile strength	Elasticity
A.	low	low
B.	low	high
C.	high	low
D.	high	high

30. Which combination of torque and speed characterises AC motors?

	Torque	Speed
A.	low	low
B.	low	high
C.	high	low
D.	high	high

31. The pivot point of a lever is termed:
- A. fulcrum
 - B. load
 - C. effort
 - D. class 2
32. The mass of a lift is 1000 kg. To raise the lift 20 m in 10 s what power of motor is required? [Assume $g = 10 \text{ ms}^{-2}$]
- A. 20 W
 - B. 200 W
 - C. 2000 W
 - D. 20000 W
33. The normal maximum load of a balsa wood bridge is 10 kg. Calculate the design load if a factor of safety of 3 is being applied.
- A. 3.3 kg
 - B. 10 kg
 - C. 30 kg
 - D. 1000 kg
34. Which of the following sensors is made from two metals with dissimilar electrochemical potentials?
- A. Thermistor
 - B. Thermocouple
 - C. Position sensor
 - D. Slotted opto-switch

35. A memory unit, *e.g.* J–K type flip flop, is an example of:
- A. sequential logic.
 - B. a NAND gate.
 - C. an output device.
 - D. an operational amplifier.
36. Which of the following is **not** a characteristic of hardwoods?
- A. They grow in tropical regions
 - B. They have broad leaves
 - C. They grow in temperate regions
 - D. They are fast growing
37. Which of the following is **not** a reason for treating cotton?
- A. Enhancing aesthetic properties
 - B. Reducing flammability
 - C. Enhancing repairability
 - D. Waterproofing
38. Which combination of protein and cholesterol content makes mycoprotein an ideal basis for novel food products simulating meat?

	Protein content	Cholesterol content
A.	high	low
B.	low	low
C.	high	high
D.	low	high

39. High volume products, such as bottles, are made of which type of glass?
- A. Soda-lime silica glass
 - B. Borosilicate glass
 - C. Toughened glass
 - D. Laminated glass
40. Which of the following chemical symbols represents an impurity removed in the production of pig iron?
- A. C
 - B. CaO
 - C. SiO₂
 - D. Fe₂O₃
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