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DESIGN TECHNOLOGY
HIGHER LEVEL
PAPER 1

Monday 9 May 2011 (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 stage of the design cycle involves most discussion between the designer and the client?

A. Brief

B. Research

C. Generating initial ideas

D. Developing a final solution

2. What is an advantage to a designer of using a perspective drawing?

A. It can be used as a working drawing for manufacturing.

B. It is easy to construct the drawing with the use of a set square.

C. It is good for communication with clients.

D. It is easy to use with CAD.

3. In the design development stage why is clay used to create a full-size model of a new car design?

A. It is cheap.

B. It is easy to manipulate.

C. It is readily available.

D. It makes the designer's role less complex.

4. **Figure 1** shows The Raven wooden coat hanger designed by Ingibjörg Hanna Bjarnadottir. Which ideas generating technique has most likely been used for the design of the coat hanger?

Figure 1: The Raven

Used with permission: www.icelandicmarket.com

A. Adaptation

B. Analogy

C. Attribute listing

D. Morphological synthesis

5. What do the lone inventor and the product champion have in common?

I. Determination

II. Knowledge

III. Design ability

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

6. What has the **least** influence on the product cycle?

A. Planned obsolescence

B. Fashion

C. New technology

D. Ergonomics

7. **Figure 2** shows the Solid Extreme mobile phone marketed by Samsung, a company which has produced many different mobile phones. It is designed to withstand extreme conditions with a heavy-duty waterproof rubber body and features a camera, FM radio, flashlight and an emergency alert system with a direct link to a nominated person. The Solid Extreme phone is an example of which corporate strategies?

Figure 2: Solid Extreme

Source: www.vodafone-promotions.co.uk . Image used with permission.

I. Product development

II. Market development

III. Diversification

A. I and II

B. II and III

C. I and III

D. I, II and III

8. Which design for manufacture (DfM) strategy would be most useful to satisfy "take-back" legislation?

A. Design for materials

B. Design for process

C. Design for assembly

D. Design for disassembly

9. Which green strategy is appropriate for disposable cameras?

A. Re-use

B. Recondition

C. Repair

D. Recycle

10. Which characteristic applies to a covalent bond?

A. Involves the sharing of electrons between molecules

B. Involves the sharing of electrons between specific atoms

C. Involves atoms in a sea of electrons

D. Involves electrostatic forces between ions

11. Which characteristic is typical of mahogany timber?

A. A light colour

B. A dark colour

C. A wide grain pattern

D. A grain pattern with knots

12. **Figure 3** shows the Armlite floor lamp which is highly adjustable but still very stable. It has a solid metal base. Which property is most important in the choice of metal for the lamp base?

Figure 3: Armlite floor lamp

Used with permission: www.pedlars.co.uk

A. Tensile strength

B. Hardness

C. Toughness

D. Density

13. What is **not** affected by creating an alloy for a metal tube?

A. Aesthetics

B. Malleability

C. Cross-sectional area

D. Tensile strength

14. Which characteristic refers to the effect of creep in a plastic material under a heavy load?

A. Molecular chains remain static

B. A 3D molecular structure is formed

C. Primary bonds weaken

D. Secondary bonds weaken

15. Piezoelectric materials are used for

A. car shock absorbers.

B. robotic limbs.

C. sensors.

D. eye-glass frames.

16. Which process is low volume?

A. Craft production

B. Mechanisation

C. Just-in-time (JIT)

D. Just-in-case (JIC)

17. Which manufacturing technique would allow for ease-of-repair?

A. Weaving

B. Stitching

C. Moulding

D. Fusing

18. Which characteristic is demonstrated by assembly-line production?

A. Products made to order

B. Unique products

C. Computer control of products

D. Standardisation of products

19. What happens after break-even point is reached?

A. Fixed costs rise

B. Variable costs rise

C. Fixed costs fall

D. Variable costs fall

20. What may be considered a moral responsibility for designers?

A. Ensuring the design is suitable for multi-national companies.

B. Ensuring the design is value-for-money.

C. Ensuring the design is fashionable.

D. Ensuring the design has planned obsolescence.

21. Manufacturers often ask consumers to complete a questionnaire when purchasing a new product. What is this an example of?

A. Expert appraisal

B. Literature search

C. User trial

D. User research

22. What is an important aspect of a field trial?

A. Product testing

B. Advertising

C. Sales

D. Design development

23. Which source of power has had least impact on the environment?

A. Wave

B. Hydro-electric

C. Water

D. Steam

24. The Kyoto Protocol international agreement focused primarily on which global strategy to reduce emissions?

A. Using economics

B. Using politics

C. Limiting technology

D. Limiting consumerism

25. What is an advantage of biomass fuel for cooking in poor rural regions of the world?

A. Low cost

B. Convenience

C. Reduction of pollution

D. Conservation of resources

26. A material is depicted by a line on a stress-strain graph. What happens to the material beyond the yield point?

A. It deforms elastically

B. It deforms plastically

C. It breaks

D. It is at its strongest point

27. Which statement is correct?

A. In a structure composed of many members, the forces in the members can be different.

B. Equilibrium can only be used to relate external loads to internal forces.

C. A structure which moves can still be in equilibrium if all the forces are balanced.

D. Internal forces may be tensile or compressive but the two cannot occur together in a single structural member.

28. Which statement is correct when referring to strain in a material?

A It is calculated by $\frac{\text{force}}{\text{area}}$

B It is calculated by $\frac{\text{change in length}}{\text{original length}}$

C It is calculated by $\frac{\text{load}}{\text{effort}}$

D It is calculated by $\frac{\text{load}}{\text{deflection}}$

29. What is an advantage of a ratchet and pawl mechanical system?

A. The teeth allow for rotation in two directions.

B. It allows for a smooth transmission of movement.

C. It increases safety in a lifting device for heavy loads.

D. It is used at high rotational speeds.

30. What would be an advantage when using a chain drive system instead of a belt drive system?

A. Cost

B. Ease of maintenance

C. Only suitable when there are long distances between shafts

D. Can be set at a precise speed of rotation

31. Which adhesive is suitable for joining two metals?

A. Polyvinyl acetate (PVA)

B. Cascamite

C. Epoxy Resin

D. Tensol cement

32. What is an advantage of injection moulding?

A. Low capital costs

B. Low energy costs

C. Suitable for complex shapes

D. Suitable for small scale production

33. **Figure 4** shows the Ribbon Rocking Chair designed by Katie Walker. What is an advantage of manufacturing the wooden frame of the chair by the technique of lamination?

Figure 4: Ribbon Rocking Chair

Used with permission: www.katiewalkerfurniture.com

A. A high strength to weight ratio

B. Low cost

C. Suitability for mass production

D. No finishing required

34. A key feature of the first Earth Summit in Rio de Janeiro (1992) was the north/south divide of countries. This division was based on:

I. Population growth in poor countries

II. Consumption patterns in rich countries

III. Cultural differences between countries

A. I and II

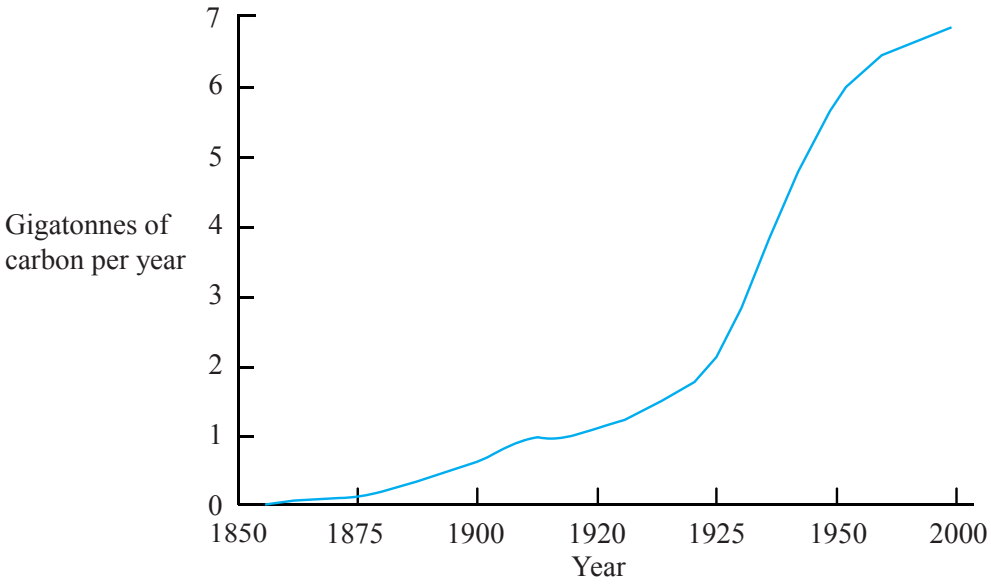
B. II and III

C. I and III

D. I, II and III

35. **Figure 5** shows a graph depicting the increase in carbon emissions from 1850 to 2000. What is the most likely reason for the dramatic rise in emissions after 1925?

Figure 5: Global carbon emissions 1850–2000



Smil, Vaclav., Energy at the Crossroads: Global Perspectives and Uncertainties, table of global carbon emissions 1850-2000, © 2003 Massachusetts Institute of Technology, by permission of The MIT Press.

A. Global population

B. Global travel

C. Mass production

D. Economic conditions

36. The u-value of a material refers to which property?

A. Thermal expansion

B. Thermal conductivity

C. Electrical resistivity

D. Density

Questions 37–40 relate to the following case study. Please read the case study carefully and answer the questions.

CASE STUDY

Figure 6 shows a set of plastic cutlery (knife, fork and spoon) designed by Julia Carlson and marketed under the title of "Greenware". The cutlery is made from biodegradable plastic derived from soy bean. Biodegradable means that the plastic is able to be broken down by the activities of living organisms and is therefore unlikely to persist in the environment at the end of its life cycle. However, the cutlery is not designed to be disposable and the handle mould for each piece is the same.

Figure 6: Biodegradable "Greenware" cutlery

"Greenware" designed by Julia Carlson

37. Which aspect of social sustainability is demonstrated by the cutlery?

A. Cultural identity

B. Stability

C. Equity

D. Accessibility

38. What is a limitation of the cutlery in relation to market appeal for ecofans?

A. Biodegradability

B. Aesthetics

C. Product life cycle

D. Standard handle component

39. Which property of the plastic cutlery is most important in relation to ease-of-use by consumers?

A. Hardness

B. Density

C. Stiffness

D. Toughness

40. Which combination of ergonomic factors is important for the function of the cutlery?

I. Anthropometrics

II. Psychological

III. Physiological

A. I and II

B. I and III

C. II and III

D. I, II and III