



MADE EASY

India's Best Institute for IES, GATE & PSUs

Test Centres: Delhi, Hyderabad, Bhopal, Jaipur, Lucknow, Bhubaneswar, Pune, Kolkata, Patna

ESE 2023 : Prelims Exam | GS & ENGINEERING CLASSROOM TEST SERIES | APTITUDE Test 5

Section A : General Principles of Design, Drawing, Importance of Safety [All Topics]

Section B : Basics of Energy and Environment [All Topics]

Section C : Basics of Material Science [All Topics]

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|---------|---------|---------|---------|---------|
| 1. (a) | 11. (b) | 21. (d) | 31. (d) | 41. (a) |
| 2. (d) | 12. (c) | 22. (b) | 32. (b) | 42. (d) |
| 3. (b) | 13. (c) | 23. (a) | 33. (d) | 43. (b) |
| 4. (b) | 14. (d) | 24. (a) | 34. (b) | 44. (a) |
| 5. (d) | 15. (c) | 25. (b) | 35. (d) | 45. (c) |
| 6. (b) | 16. (d) | 26. (a) | 36. (b) | 46. (a) |
| 7. (d) | 17. (c) | 27. (c) | 37. (a) | 47. (a) |
| 8. (d) | 18. (b) | 28. (d) | 38. (d) | 48. (a) |
| 9. (b) | 19. (a) | 29. (a) | 39. (a) | 49. (c) |
| 10. (d) | 20. (a) | 30. (c) | 40. (d) | 50. (b) |

DETAILED EXPLANATIONS

1. (a)

Economy, appearance, durability and marketability of a design are unimportant if the product does not function properly.

2. (d)

The 4C's of the design are creativity, complexity, choice and compromise.

3. (b)

A Kano diagram depicts how expected customer satisfaction (shown on y -axis) can vary with the success of the execution (shown on x -axis) for customer requirements.

4. (b)

Brain storming does not surmount many emotional and environmental blocks. So, to mitigate these effects, a team conduct a brain writing exercise prior to the formal brain storming session.

5. (d)

In Groupthink, cohesiveness of a group is maintained and people prefer to keep quiet even on overriding opinion.

6. (b)

- **Design for reliability** → By designing for reliability, the capacity for the product to operate without failure in the service increases.
- **Design for robustness** → By designing for robustness, excellent performance under the wide range of conditions is achieved.
- **Failure mode and effects analysis** → By performing FMEA, we can determine all possible ways by which the components can possibly fail in service and establish the effects of the failure on the system thus improving the performance and quality.
- **Design for tolerance** → Permissible tolerances must be placed on dimensions of a part to limit the acceptable variations in the size of a part.

8. (d)

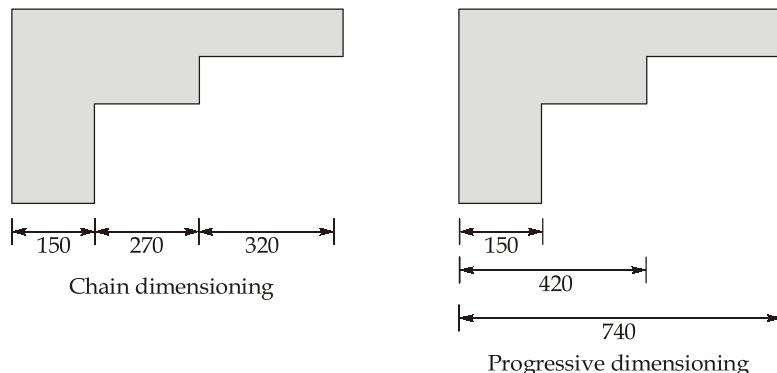
Synectics is not a barrier to creative thinking. It is a methodology for creativity based on reasoning by analogy.

9. (b)

In engineering system of paper sizes:

$$\begin{aligned}A_0 &= 1189 \text{ mm} \times 841 \text{ mm} \\A_1 &= 841 \text{ mm} \times 594 \text{ mm} \\A_2 &= 594 \text{ mm} \times 420 \text{ mm} \\A_3 &= 420 \text{ mm} \times 297 \text{ mm} \\A_4 &= 297 \text{ mm} \times 210 \text{ mm}\end{aligned}$$

10. (d)



11. (b)

$$\text{Sum of the interior angles of a polygon} = (n - 2) \times 180^\circ$$

$$\text{Sum of the exterior angles of a polygon} = 360^\circ$$

$$\text{Here, } (n - 2) \times 180^\circ = 360^\circ$$

$$\Rightarrow n = 4 \text{ (Quadrilateral)}$$

12. (c)

Let,

 r = Radius of generating circle R = Radius of directing circle

$$\text{Directing angle, } \theta = 360^\circ \times \frac{r}{R}$$

$$\therefore r = 20\% \text{ of } R = \frac{R}{5}$$

$$\therefore \theta = 360^\circ \times \frac{R}{5R} = 72^\circ$$

$$\text{Number of epicycloids, } n = \frac{360^\circ}{72^\circ} = 5$$

or

If

$$R = nr$$

then,

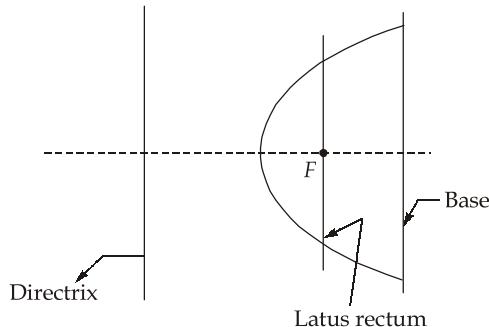
 n = Number of epicycloids

here,

$$R = 5r$$

$$\therefore \text{Number of epicycloids} = 5$$

13. (c)



15. (c)

- In isometric view, isometric axis and isometric lines are drawn to true scale whereas in isometric projection they are drawn to isometric scale.
- Isometric scale is used to draw isometric projection in which the isometric length is $\sqrt{\left(\frac{2}{3}\right)}$ times the actual length.

17. (c)

- The plane inclined to HP and perpendicular to VP represents AIP.
- The plane inclined to the VP and perpendicular to the HP represents AVP.

19. (a)

Derive safeguards is about placing specific 'fall backs' into the overall project plan as contingencies for risks if they arise. It is a risk management process, not a benefit of CBA.

20. (a)

The epidemiological theory in very general terms explains causal association between diseases or other biological processes (accidents) and specific environmental experiences.

24. (a)

Concurrent engineering is implemented with a cross-functional team structured as a matrix team or pure-project organization.

Every group, department, or contractor responsible for or influenced by some piece of the project has the opportunity to participate in the project and contribute to key decisions.

26. (a)

An appeal against order/decision/ award of the NGT lies to the Supreme Court, generally within ninety days from the date of communication.

27. (c)

In Amensalism, one species is harmed and the other is unaffected.

29. (a)

Oxygen is less soluble in warm water.

36. (b)

Human activities that do not adversely affect the ecological diversity of the biosphere, may be allowed in the buffer zone.

38. (d)

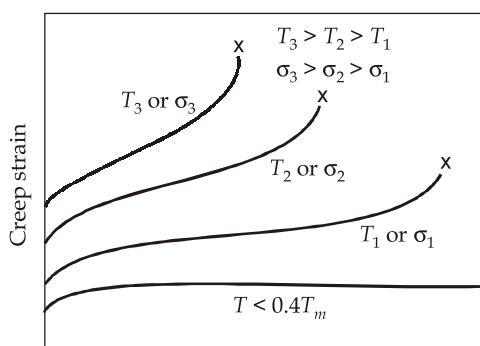
In the parasitic food chain, the pyramids are always inverted.

39. (a)

Selective leaching is found in solid solution alloys when one element or constituent is preferentially removed. Eg: Dezinification of brass.

40. (d)

As the temperature increase instandoubts creep as well as rate of creep strain increases.



41. (a)

1. High carbon content in Nickel steels is not preferred.
2. Cryogenic steels used for very low temperature applications are high Nickel based steels.
So statement 3 is incorrect.

42. (d)

Aramid fibre reinforced polymer composites have high longitudinal tensile strength. They have high resistance to fatigue and creep. They are excellent strength to weight ratio and used in production of bullet proof vests.

43. (b)

Thermoplastics are generally made by addition polymerization whereas thermosetting polymers are made by condensation polymerization.

44. (a)

Let the concentration at the given point is $C_0\%$.

$$W_\alpha = \frac{C_\beta - C_0}{C_\beta - C_\alpha} = \frac{70 - C_0}{70 - 10}$$

$$\begin{aligned} 0.3 \times 60 &= 70 - C_0 \\ C_0 &= 70 - 18 = 52\% \end{aligned}$$

46. (a)

A dielectric material is a substance that is a poor conductor of electricity : on the basis of band structure, the dielectric materials have an energy gap of 3 eV or more.

47. (a)

$$\therefore \rho \propto \sqrt{T}$$

with the increase of temperature collision of electrons increases and hence resistivity of metal also increases.

48. (a)

Nichrome has highest resistivity among them,

Material	Resistivity ($\Omega\text{-m}$)
Mercury	94×10^{-8}
Manganin	44×10^{-6}
Constantan	49×10^{-6}
Nichrome	100×10^{-6}

49. (c)

The energy gap in Si and Ge are 1.12 and 0.66 eV, respectively.

50. (b)

For intrinsic semiconductor,

$$\begin{aligned} \text{Conductivity, } \sigma &= n_i e (\mu_n + \mu_p) \\ \sigma &= (2.5 \times 10^{19}) \times (1.6 \times 10^{-19}) (0.35 + 0.15) \\ &= 2 \text{ mho/m} \end{aligned}$$

$$\text{So resistivity, } \rho = \frac{1}{\sigma} = \frac{1}{2.0} = 0.50 \Omega\text{-m}$$

