CBSE Class 12 Design Thinking and Innovation Question Paper with Solutions(Memory Based)

Time Allowed :3 Hours	**Maximum Marks :**70	**Total questions :**37

General Instructions

Read the following instructions very carefully and strictly follow them:

1. Please check that this question paper contains 15 printed pages.
2. Q.P. Code given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.
3. Please check that this question paper contains 37 questions.
4. 15 minute time has been allotted to read this question paper. The question paper will be distributed at 10.15 a.m. From 10.15 a.m. to 10.30 a.m., the candidates will read the question paper only and will not write any answer on the answer-book during this period.

1. Explain the difference between Divergent and Convergent thinking with real-world examples.

Correct Answer: Comparison with examples given below.

Solution:

Concept: Divergent and convergent thinking are two complementary cognitive processes used in problem-solving and creativity. While divergent thinking focuses on generating multiple ideas, convergent thinking emphasizes narrowing down to the best possible solution.

Explanation:

1. Divergent Thinking: Divergent thinking involves exploring many possible solutions or ideas for a single problem. It encourages creativity, imagination, and open-ended exploration.

- Focuses on idea generation and innovation

- No single correct answer
- Encourages brainstorming and originality

Real-world examples:

- Brainstorming marketing ideas for a new product
- Generating multiple story plots for a film
- Designing creative advertising campaigns

2. Convergent Thinking: Convergent thinking involves analyzing and evaluating different ideas to select the most effective or logical solution. It is structured and goal-oriented.

- Focuses on decision-making and accuracy
- Leads to a single best answer
- Involves logic, analysis, and evaluation

Real-world examples:

- Choosing the best marketing strategy from several options
- Solving a mathematical problem with one correct answer
- Selecting the most practical design for a product

Key Difference:

Basis	Divergent Thinking	Convergent Thinking
Approach	Creative and exploratory	Logical and analytical
Number of solutions	Multiple possible solutions	One best solution
Purpose	Idea generation	Decision-making
Nature	Open-ended	Structured

Thus, divergent thinking generates a wide range of ideas, while convergent thinking refines those ideas to arrive at the most suitable solution.

Quick Tip

Divergent = Many ideas Convergent = One best idea

2. Define the Point of View (POV) statement and explain its role in the 'Define' stage of design thinking.

Correct Answer: Definition and role explained below.

Solution:

Concept: In design thinking, the Define stage focuses on synthesizing insights gathered during the Empathize stage to clearly articulate the core problem. A Point of View (POV) statement is a user-centered problem statement that guides ideation and solution development.

Definition of POV Statement: A Point of View (POV) statement is a concise and meaningful expression of a user's needs and insights, framed from the user's perspective. It typically includes:

- The specific user (who)
- Their need (what)
- The insight (why it matters)

A common format is: *[User] needs a way to [need] because [insight].*

Role in the Define Stage: The POV statement plays a crucial role in shaping the direction of the design process:

- **Clarifies the problem:** Transforms raw research data into a clear, actionable problem statement.
- **User-centered focus:** Keeps the design process grounded in real user needs rather than assumptions.
- **Guides ideation:** Serves as a foundation for brainstorming relevant and innovative solutions.
- **Prevents scope creep:** Helps teams avoid solving unrelated or overly broad problems.
- **Encourages empathy-driven design:** Ensures solutions are meaningful and impactful for users.

Example: *A busy college student needs a quick way to organize daily tasks because they often feel overwhelmed managing multiple deadlines.*

Thus, the POV statement is a powerful tool in the Define stage that converts user insights into a focused, actionable design challenge.

Quick Tip

POV = User + Need + Insight It turns empathy into a clear problem statement for ideation.

---

3. Why is Empathy considered the foundation of Human-Centric Design (HCD)?

Correct Answer: Explanation given below.

Solution:

Concept: Human-Centric Design (HCD) focuses on creating solutions that are deeply rooted in the needs, emotions, and experiences of users. Empathy is considered the foundation of HCD because it enables designers to truly understand the people they are designing for.

Explanation: Empathy involves putting oneself in the user's position to understand their challenges, motivations, behaviors, and context. It is the starting point of the design thinking process and ensures that solutions are meaningful and relevant.

Reasons why empathy is the foundation of HCD:

- **Deep understanding of users:** Empathy helps designers uncover real needs rather than relying on assumptions or stereotypes.
- **User-centered solutions:** By understanding users' emotions and experiences, designers can create solutions that are practical and impactful.
- **Reveals hidden problems:** Empathetic research methods like observation and interviews often uncover unmet or unarticulated needs.
- **Improves innovation:** When designers understand users deeply, they are more likely to generate creative and meaningful ideas.

- **Builds emotional connection:** Empathy ensures that products and services resonate with users on an emotional level, increasing acceptance and satisfaction.
- **Reduces design bias:** Encourages designers to move beyond their own perspectives and design inclusively for diverse users.

Example: In healthcare design, empathetic understanding of patients' fears and discomfort can lead to more user-friendly hospital environments and patient-centered services.

Thus, empathy forms the foundation of Human-Centric Design because it ensures that all design decisions are guided by a genuine understanding of human needs and experiences.

Quick Tip

Empathy = Understanding users deeply No empathy $\rightarrow$ No true human-centered design.

---

4. Describe the 'Hear, Create, Deliver' framework used in social innovation projects.

Correct Answer: Framework explained below.

Solution:

Concept: The 'Hear, Create, Deliver' framework is a simplified model used in social innovation and human-centered design projects. It provides a structured approach to understanding community needs, developing solutions, and implementing them effectively.

Explanation:

1. Hear: This stage focuses on listening and understanding the people for whom the solution is being designed.

- Conduct interviews, observations, and field research
- Understand user needs, challenges, and context
- Identify insights and real problems
- Build empathy with stakeholders

2. Create: In this phase, insights gathered during the Hear stage are used to generate ideas and develop solutions.

- Brainstorm innovative ideas
- Develop concepts and prototypes
- Collaborate with users and stakeholders
- Test and refine possible solutions

3. Deliver: This stage focuses on implementing and scaling the solution in real-world settings.

- Launch the solution or pilot project
- Monitor impact and collect feedback
- Improve based on user response
- Plan for sustainability and scalability

Significance: The framework ensures that social innovation projects remain user-centered, practical, and impactful by moving systematically from understanding to action.

Thus, the 'Hear, Create, Deliver' model provides a simple yet powerful roadmap for designing and implementing meaningful social innovations.

Quick Tip

Hear → Understand users Create → Design solutions Deliver → Implement and scale

---

5. What are the advantages of creating a Low-Fidelity Prototype over a high-fidelity one in the early stages?

Correct Answer: Advantages explained below.

Solution:

Concept: Prototyping is a key stage in design thinking where ideas are turned into tangible

forms for testing. Low-fidelity prototypes are simple, rough representations (e.g., sketches, paper models), whereas high-fidelity prototypes are detailed and realistic. In early stages, low-fidelity prototypes are often preferred.

Explanation: The advantages of low-fidelity prototypes in the early stages include:

- **Quick and easy to create:** Can be made rapidly using simple materials like paper, cardboard, or wireframes.
- **Cost-effective:** Requires minimal resources, making it ideal for early experimentation.
- **Encourages creativity:** Teams feel more comfortable exploring bold ideas since changes are easy and inexpensive.
- **Easy to modify:** Iterations can be done quickly based on feedback.
- **Focus on concept, not aesthetics:** Keeps attention on functionality and user experience rather than visual polish.
- **Facilitates early feedback:** Users are more willing to critique rough models, leading to honest insights.
- **Supports rapid iteration:** Enables multiple cycles of testing and refinement in a short time.
- **Reduces risk:** Identifies flaws early before investing in costly high-fidelity development.

Conclusion: Low-fidelity prototypes are highly valuable in the early stages because they promote rapid experimentation, creativity, and user-centered refinement while saving time and resources.

Quick Tip

Low-fidelity = Fast, cheap, flexible Best for early testing and rapid iteration.

---

6. Describe the use of Fractals and Grids in traditional Indian architecture and temple design.

Correct Answer: Description given below.

Solution:

Concept: Traditional Indian architecture and temple design are deeply rooted in geometry, symbolism, and cosmology. Two important design principles commonly observed are the use of fractals and grids. These elements contribute to structural harmony, spiritual symbolism, and visual balance.

Explanation:

1. Use of Grids in Indian Architecture: Grids form the foundational planning system in many traditional Indian structures, especially temples and cities.

- **Vastu Purusha Mandala:** A sacred geometric grid used as the blueprint for temple layouts and town planning.
- **Symmetry and proportion:** Grids ensure balanced spatial organization and alignment with cardinal directions.
- **Hierarchical zoning:** Different sections of temples (garbhagriha, mandapa, pradakshina path) are arranged within grid divisions.
- **Cosmic symbolism:** The grid represents the universe, linking architecture with spiritual beliefs.

2. Use of Fractals in Temple Design: Fractals refer to repeating patterns that appear similar at different scales, a feature commonly seen in temple architecture.

- **Recursive structures:** Smaller replicas of larger forms (e.g., miniature shikharas on main towers).
- **Self-similarity:** Decorative motifs repeat across scales in carvings and ornamentation.
- **Complex visual depth:** Layered patterns create intricate and dynamic visual experiences.
- **Symbolic infinity:** Repeating forms reflect philosophical ideas of eternity and cosmic continuity.

Significance:

- Enhances aesthetic harmony and mathematical precision

- Integrates art, science, and spirituality
- Reflects advanced knowledge of geometry in ancient India

Thus, grids provide structural order and sacred alignment, while fractals contribute intricate repetition and symbolic depth in traditional Indian temple architecture.

Quick Tip

Grids = Structure and symmetry Fractals = Repeating patterns and self-similarity

---

7. How can Mind Mapping help a design team during the Ideation phase?

Correct Answer: Explanation given below.

Solution:

Concept: Mind Mapping is a visual brainstorming technique that organizes ideas around a central concept. During the Ideation phase of design thinking, it helps teams generate, structure, and expand creative ideas in a collaborative and intuitive way.

Explanation: Mind Mapping supports design teams in several ways during ideation:

- **Encourages free thinking:** Allows team members to explore ideas without rigid structure, promoting creativity.
- **Visual organization of ideas:** Helps arrange thoughts in a branching format, making complex ideas easier to understand.
- **Stimulates idea generation:** One idea can trigger multiple related ideas, leading to a wide pool of concepts.
- **Identifies connections:** Reveals relationships between themes, problems, and potential solutions.
- **Supports collaboration:** Multiple team members can contribute simultaneously, making it ideal for group brainstorming.
- **Prevents idea loss:** Captures spontaneous thoughts that might otherwise be forgotten.

- **Aids prioritization:** Helps teams later group and filter ideas for feasibility and impact.
- **Enhances clarity:** Converts abstract thinking into a structured visual map.

Example: While designing a sustainable packaging solution, a team can place the central idea in the middle and branch out into materials, user needs, cost, environmental impact, and aesthetics.

Thus, mind mapping enhances creativity, collaboration, and structured ideation, making it a powerful tool in the Ideation phase of design thinking.

Quick Tip

Mind Map = Central idea + branching ideas Great for brainstorming and visual ideation.

---

8. What is a User Journey Map, and how does it help identify ”pain points” for a consumer?

Correct Answer: Definition and explanation given below.

Solution:

Concept: A User Journey Map is a visual representation of the steps a user takes while interacting with a product, service, or brand over time. It captures the user's actions, thoughts, emotions, and experiences at different touchpoints.

Definition: A User Journey Map outlines the complete experience of a user from initial awareness to final interaction (and sometimes post-use), highlighting how the user engages with a system across various stages.

How it helps identify pain points: Pain points are moments where users face frustration, confusion, delays, or unmet needs. A User Journey Map helps uncover these issues in the following ways:

- **Step-by-step visualization:** Breaks down the user experience into stages, making it easier to spot where problems occur.

- **Captures user emotions:** Tracks how users feel at each stage, revealing frustration or dissatisfaction.
- **Identifies friction areas:** Highlights obstacles such as complicated interfaces, long wait times, or unclear instructions.
- **Reveals unmet needs:** Shows gaps between user expectations and actual experience.
- **Improves empathy:** Helps teams understand the experience from the user's perspective.
- **Guides solution design:** Provides actionable insights for improving usability and satisfaction.

Example: In an online shopping journey, pain points might include difficult navigation, slow checkout, hidden costs, or delayed delivery. Mapping the journey makes these issues visible and solvable.

Thus, a User Journey Map is a powerful tool for visualizing user experiences and identifying pain points that guide better design decisions.

Quick Tip

User Journey Map = Visual story of user experience It reveals pain points by mapping actions, emotions, and touchpoints.

---

9. How do the Sustainable Development Goals (SDGs) act as a roadmap for modern innovators?

Correct Answer: Explanation given below.

Solution:

Concept: The Sustainable Development Goals (SDGs), established by the United Nations in 2015, are a set of 17 global goals aimed at addressing major social, economic, and environmental challenges by 2030. They provide a shared framework for governments, businesses, and innovators to work toward sustainable progress.

Explanation: The SDGs act as a roadmap for modern innovators in several important ways:

- **Clear global priorities:** SDGs define pressing challenges such as poverty, climate change, health, education, and inequality, guiding innovators toward impactful problem areas.
- **Purpose-driven innovation:** Encourages innovators to create solutions that are socially and environmentally responsible, not just profitable.
- **Interdisciplinary approach:** SDGs promote collaboration across sectors like technology, healthcare, education, and sustainability.
- **Scalability and global relevance:** Innovations aligned with SDGs often address universal problems, making them scalable across regions and populations.
- **Funding and support opportunities:** Many investors, NGOs, and governments prioritize SDG-aligned projects, providing access to grants and partnerships.
- **Measurable impact:** SDGs include targets and indicators, allowing innovators to track and demonstrate real-world impact.
- **Ethical innovation:** Encourages responsible design that balances economic growth with social equity and environmental protection.
- **Future-oriented vision:** Provides a long-term direction for sustainable development and innovation strategies.

Example: An innovator developing affordable solar lighting solutions contributes to SDG 7 (Affordable and Clean Energy) and SDG 13 (Climate Action).

Thus, the SDGs serve as a strategic guide for innovators by aligning creativity and entrepreneurship with global sustainability goals.

Quick Tip

SDGs = Innovation with purpose They guide innovators toward impactful, sustainable solutions.

---

10. Differentiate between User Interface (UI) and User Experience (UX) in the context of mobile app design.

Correct Answer: Comparison given below.

Solution:

Concept: In mobile app design, User Interface (UI) and User Experience (UX) are closely related but distinct concepts. UI focuses on the visual and interactive elements of the app, while UX focuses on the overall experience and usability from the user's perspective.

Explanation: The differences between UI and UX are as follows:

Basis	**User Interface (UI)**	**User Experience (U**
Definition	Visual and interactive elements of the app	Overall experience of usi
Focus	Look and feel	Usability and satisfa
Components	Colors, typography, buttons, icons, layout	Navigation, flow, accessibili
Goal	Make the app visually appealing and interactive	Make the app easy, intuitive, and
Design Approach	Graphic and visual design	Research-driven and user-ce
Example	Attractive button styles and animations	Smooth checkout process with

Relationship: UI is a part of UX. A mobile app may look beautiful (good UI) but still be difficult to use (poor UX). The best apps balance both aesthetics and usability.

Thus, UI deals with how an app looks and interacts visually, while UX focuses on how the app feels and functions for the user.

Quick Tip

UI = How it looks UX = How it works and feels
