

UNIT 6: WIREFRAMING AND PROTOTYPING · 6 HOURS

Wireframing & Prototyping

From mental concept to clickable reality:

Wireframes · Mockups · Storyboards · Software Tools · Transitions · Interactive
Prototypes

BCA 2nd Semester

Tribhuvan University

6 Interactive Demos

Exam Question Bank

Unit 6 Syllabus & Learning Roadmap

Official Tribhuvan University BCA 2nd Semester curriculum breakdown:

Section	Curriculum Topic	Core Practical Skills & Interactive Demos
§6.1	Wireframes and mock-ups	Structure vs Visual styling · Blueprint analogy · Interactive Wireframe $\rightarrow$ Mockup Lens
§6.2	Prototyping: Lo-Fi, Hi-Fi & Interactive	Paper vs digital · Cost/Speed tradeoff · Live 3-Stage Fidelity Switcher
§6.3	UX storyboarding, mockups	Empathy mapping · Real-world context & emotions · 4-Scene Comic Storyboard Stepper
§6.4	Software prototyping	Figma, Framer, ProtoPie · Frames & interactions · Interactive Figma Canvas Demo
§6.5	Transition and animation to prototypes	Push, Modal, Dissolve, Smart Animate · Easing curves · Live Motion Physics Lab
§6.6	Creating a simple clickable prototype	Hotspots, triggers, actions & backstacks · Full 4-Screen Working Phone Simulator

The Big Picture: Building a Digital Product

Think of designing software like building a family home. You never start by painting walls or pouring concrete. You progress through 4 clear evolutionary stages:

Stage 1

1. Wireframe



The Blueprint: Where do rooms, doors, and walls go? No paint, no furniture.
Low-cost layout & spacing

Stage 2

2. Mock-up



Interior Design: Wall paint colors, sofa fabrics, lighting fixtures, branding.
Visual aesthetic & styling

Stage 3

3. Prototype



Working Model: Turn light switch → bulb glows. Turn faucet → water runs.
Interactive behavior & flow

Stage 4

4. Code / Production



The Finished House: Brick, steel, electrical grid, actual living occupants.
HTML, CSS, JS, Database

What is a Wireframe?

A Wireframe is a basic, two-dimensional skeletal layout of a screen. It defines content hierarchy, layout structure, and functionality without using colors, custom typography, images, or branding.

Key Characteristics

- Black, White & Grayscale: Eliminates subjective debates over "I don't like purple".
- Box Placeholders: Images are represented by rectangular boxes with an X inside.
- Greek / Placeholder Text: Uses lorem ipsum or simple labels ("Headline", "Price") to test content flow.
- Structural Focus: Answers: Where does the navigation bar sit? Where does the primary CTA button go?

Why Designers Never Skip Wireframing

⚡ Extreme Speed: Can sketch 10 different layout ideas in 20 minutes on paper.

🎯 Zero Ego & Fast Feedback: Clients focus on whether the user can find the button, rather than nitpicking the font.

💰 Saves Development Cost: Catching a flawed checkout flow at wireframe stage takes 5 minutes to fix.

What is a Mock-up?

A Mock-up is a high-fidelity, static visual representation of the final design. It introduces color schemes, real typography, high-resolution photography, brand iconography, and visual hierarchy.

What a Mock-up Brings to Life

- Brand Identity: Precise brand colors (e.g. Spotify green, Airbnb coral).
- Typographic Personality: Exact font families, weights, letter-spacing, and line-heights.
- Visual Depth & Affordance: Drop shadows, card borders, elevation, and glassmorphism.
- Emotional Tone: High-res food photos, friendly microcopy, and trustworthy badges.

Important Distinction: Static vs Dynamic

A Mock-up is STATIC: It is a picture of what the app will look like. You cannot click buttons, scroll feeds, or type in form fields.

Primary Purpose: Stakeholder design approval, marketing previews, and visual styling guidelines for front-end developers.

Wireframe vs Mock-up vs Prototype

Clear comparison of the three primary design deliverables (Frequent TU BCA exam question):

Dimension	Wireframe (Layout)	Mock-up (Visuals)	Prototype (Experience)
Primary Question	"Where does stuff go?"	"What does it look like?"	"How does it feel and work?"
Visual Fidelity	Low (Grayscale boxes, outlines)	High (Colors, typography, images)	Medium to High
Interactivity	None (Static sketch or wire)	None (Static artwork/PNG)	Fully Clickable & Interactive
Typical Tools	Pen & Paper, Balsamiq, Whimsical	Figma, Sketch, Adobe XD	Figma, Framer, ProtoPie
Best Used For	Information architecture, early flow validation	Brand alignment, client visual sign-off	User usability testing, developer handoff

Interactive Lens - Wireframe $\leftrightarrow$ Mock-up

Toggle between Wireframe mode and Mockup mode to see how the exact same product card transforms:

 Wireframe Mode

 Mock-up Mode

Polished Mockup

Live CSS Transformation

Mockup Mode: Real brand colors, vibrant food photography, custom typography, shadows, ratings, and active CTA button. Focuses on visual design and brand identity.

 Notice: The underlying layout, spacing, and content hierarchy remain 100% identical. Only the visual styling changes.



Top Rated ★ 4.9

20-30 min

Artisan Truffle Pizza

Wild mushrooms, fresh truffle oil, buffalo mozzarella.

Rs. 650

+ Add to Order

What is a Prototype? Why Build One?

A Prototype is an interactive simulation of a digital product. It allows users and stakeholders to click, tap, navigate, and experience the product workflow before writing a single line of production code.



1. Test Usability

Can users complete tasks without confusion? Watching real people try a prototype reveals where they get stuck, confused, or frustrated.



2. Prevent Code Waste

Coding a full web or mobile app takes weeks and costs thousands. Changing a clickable prototype in Figma takes 10 minutes. Fail fast, cheaply!



3. Crystal Clear Alignment

Instead of writing 50–page text requirement documents, designers give developers a clickable prototype showing the exact transitions and flows.

Low-Fidelity (Lo-Fi) Prototyping

Low-Fidelity Prototyping: Quick, rough, and disposable representations of ideas. Common formats include paper sketches, sticky note flows, and digital wireframes.

The Classic Paper Prototype

Designers sketch screens on paper index cards. During user testing:

- The user taps their finger on a paper "button".
- A designer acts as the "Human Computer" and drops the next paper screen in front of them!
- Sticky notes act as dropdown menus and alert popups.

✨ **Advantage: Zero barrier to entry. Anyone can participate!**

When to Use Lo-Fi Prototyping

Brainstorming Sessions: Testing 5 completely different navigation models in 1 afternoon.

Mapping Information Flow: Determining whether checkout needs 2 steps or 4 steps.

Unfiltered Feedback: Users give more honest critical feedback on rough sketches because they know you didn't spend 40 hours perfecting it!

High-Fidelity (Hi-Fi) Prototyping

High-Fidelity Prototyping: Realistic, polished, and dynamic simulations that closely mirror the final product in both visual appearance and interaction behavior.

Characteristics of Hi-Fi Prototypes

- Pixel-Perfect Visuals: Final design tokens, brand palettes, font weights, real photos.
- Micro-Interactions: Button hover glows, active pressed feedback, toggles smoothly sliding.
- Smooth Page Transitions: Screens slide in, modals open from bottom, loaders spin realistically.
- Dynamic Data Simulation: Realistic names, product prices, and calculations.

When to Build a Hi-Fi Prototype

1. Formal Usability Testing: Measuring exact task completion times and error rates with real customers.
2. Client & Investor Demos: Pitching a startup idea or getting executive sign-off before spending capital on engineering.
3. Developer Handoff: Showing engineers the exact transition curves, modal gestures, and edge states.

What is Interactive Prototyping?

Interactive Prototyping transforms disconnected static screens into a responsive journey by defining Hotspots (clickable regions), Triggers (tap, hover, drag), and Actions (navigate, open overlay, back).

Step 1

Hotspots & Triggers

Selecting an element (e.g. a "Buy Now" button) and assigning a trigger: On Click, On Hover, While Pressing, or After Delay.

Step 2

Destination & Action

Specifying what happens: Navigate to Screen B, Open Modal Overlay, Scroll to Section, or Go Back.

Step 3

Transition & Easing

Choreographing motion: Instant, Slide in from Right, Smart Animate, paired with duration (300ms) and easing (Ease Out).

Lo-Fi vs Hi-Fi Prototyping Comparison

Summary comparison for UX decision making and exam revision:

Evaluation Factor	Low-Fidelity (Lo-Fi)	High-Fidelity (Hi-Fi)
Creation Speed	Minutes to hours	Days to weeks
Cost & Resources	Near zero (Paper, sharpies, wireframe tools)	Significant (UI design software, assets, design systems)
Look & Feel	Rough, incomplete, grayscale, sketchy	Realistic, polished, branded, pixel-perfect
Flexibility to Change	Extremely high (discard in seconds)	Moderate (requires adjusting multiple connected components)
User Testing Focus	Concept validation, flow logic, mental models	Visual clarity, micro-interactions, realistic task completion
Emotional Attachment	None (no one falls in love with a paper sketch)	High (designers and clients can be protective of visual work)

Interactive 3-Stage Fidelity Switcher

Select each fidelity tier to see the screen evolve from paper sketch to digital wireframe to final product:

1. Lo-Fi Paper

Rough

Pen, paper, concept validation

2. Mid-Fi Wireframe

Structure

Digital grayscale, layout spacing

3. Hi-Fi Mockup

Polished

Vibrant colors, photos, brand polish

Level 1: Low-Fidelity (Lo-Fi)

Active View

Purpose: Fast concept validation, mapping user flows, brainstorming with teammates without emotional attachment.

🕒 Creation Time: 5-15 Minutes

💰 Cost & Effort: Near \$0 (Paper, pen, sticky)

[LOGO] QuickBite

[MENU]

~ BANNER SKETCH ~

[ITEM 1: Pizza]

[ITEM 2: Burger]

[ADD TO CART]

What is UX Storyboarding?

A UX Storyboard is a visual comic strip that illustrates how a real human user interacts with a product within their daily life, physical environment, and emotional context.

Origin: From Walt Disney to UX Design

In the 1930s, Walt Disney studios invented storyboarding to map out animated movies before drawing thousands of expensive animation frames.

In UI/UX, we use storyboards for the exact same reason: to visualize the human story before spending months building software that nobody needs.

Why Screen Mockups Aren't Enough

A beautiful mockup shows what buttons look like on a monitor. A storyboard shows:

- Physical context: Is the user walking in the rain? Holding a baby? Driving?
- Emotional pressure: Are they anxious, in a hurry, or relaxed on a sofa?
- The Trigger: What real-world event made them pick up the phone?

The 4-Part Anatomy of a UX Storyboard

Every effective UX storyboard follows a classic four-panel storytelling arc:

Panel 1

1. The Problem



Setting & Pain Point:
Establish persona,
physical setting, and the
urgent problem causing
stress.

Panel 2

2. The Discovery



The Trigger: The user
discovers the app or gets
a smart contextual
notification offering
assistance.

Panel 3

3. The Action



Frictionless Use: User
accomplishes the primary
task in 2–3 clean taps with
clear feedback.

Panel 4

4. Resolution



Emotional Relief: The
problem is solved. User
feels relieved, satisfied,
and empowered.

Interactive UX Storyboard Walkthrough

Case study: Maya needs late-night food while studying at the campus lab. Click any panel or use arrows:

1  "Lab closes in 30 mins and I'm starving..." Context: University lab, 9:45 PM, empty stomach.	2  "1-Tap reorder my warm soup bowl?" Trigger: QuickBite smart widget predicts her favorite.	3  "Order confirmed! Rider 12 min away." Action: FaceID checkout & real-time GPS tracker.	4  "Hot meal delivered right on time!" Resolution: Eats peacefully and aces her meeting.
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Scene 1: The Context & Pain Point

 **Hungry & Overwhelmed**

Maya is working late at her university lab (9:45 PM). She realizes she skipped dinner, the campus canteen is closed, and she has only 20 minutes before her next research call.

Key UX Takeaway: Storyboards start with human context: Who is the user? Where are they? What is their emotional pressure point?

← Prev Scene

Next Scene →

Software Prototyping: Modern Tooling

Software Prototyping uses dedicated digital design tools to construct interactive simulations without writing code. These tools generate realistic interactions, transitions, and component states rapidly.

Why Use Software Instead of Writing Code?

- 10x Faster Iteration: Repositioning 5 buttons across 20 screens takes 30 seconds in software vs hours in code.
- Non-Technical Collaboration: Product managers, copywriters, and clients can leave comments directly on pins.
- Instant Cloud Sharing: One link lets anyone test the prototype on their actual iPhone or Android phone.
- Design System Inheritance: Update the primary color once in your library, and all 100 prototype screens update instantly.

The 3 Core Concepts in Software Prototyping

1. Frames / Artboards: Each individual screen (e.g. iPhone 15 Frame, Desktop Frame).
2. Hotspots & Noodles: Clickable regions connected by visual blue wires to destination frames.
3. Component Variants: Managing interactive states (Default, Hover, Pressed, Loading) in one master component.

Industry Prototyping Software Compared

The modern UX industry standard landscape:

Software	Fidelity	Primary Strengths	Best Used For
Figma Industry Standard	Mid to High	Cloud-native, multiplayer real-time collaboration, auto-layout, interactive components, instant mobile testing.	Daily industry work, team handoffs, design systems.
Framer Web & Code	Ultra High	Production-grade responsive layouts, real input forms, native CSS transforms, publish to live URL.	Landing pages, high-stakes investor prototypes.
ProtoPie Advanced Logic	Ultra High	Hardware sensor triggers (camera, gyroscope, microphone), formulas, variables, conditional logic.	Smartwatch apps, automotive dashboards, games.
Balsamiq Wireframe Tool	Low (Sketchy)	Deliberately rough, hand-drawn aesthetic to keep conversations focused on architecture, not aesthetics.	Rapid early brainstorming, non-designer ideation.

Motion With Purpose: Why Animate?

In UI design, animation is not decoration, it is communication. Intentional motion provides spatial orientation, confirms user actions, and reduces cognitive load.

Role 1

Spatial Orientation

When Screen B slides in from the right, the user's brain understands: "I drilled deeper into the hierarchy; swiping back left will return me home."

Role 2

Direct Manipulation

Buttons depress when pressed, switches glide across tracks, and pull-to-refresh stretches elastically. This mimics physical physics in the real world.

Role 3

Continuity & Focus

A photo thumbnail expanding smoothly into the hero banner (Smart Animate) keeps user focus anchored, avoiding jarring jump cuts.

Common UI Transition Types

The fundamental motion patterns used across mobile and web interfaces:

Transition	Visual Motion	Mental Model	Common Real-World Use
Instant	Oms immediate frame replacement	No spatial relationship	Tab switches, desktop menu items
Push / Slide Left	Old screen moves left, new screen enters from right	Hierarchical drill-down	iOS navigation stacks, settings sub-menus
Modal Slide Up	New card slides up from bottom over existing screen	Temporary focused sub-task	Share sheets, payment confirmation, filters
Cross-Dissolve	Old screen fades out while new screen fades in	State change in same location	Dark/light mode switch, photo gallery change
Smart Animate	Matching layers interpolate size, position & radius	Object continuity & morphing	Thumbnail → Fullscreen article, floating button → form

Understanding Easing: Why Linear Feels Wrong

Easing controls the acceleration and deceleration of an animation over time. In nature, nothing moves at a constant robotic speed; objects accelerate and decelerate due to mass, friction, and gravity.

Avoid

Linear Motion

`linear`

Starts instantly at full speed and stops dead with zero slowdown. Feels mechanical, robotic, and unnatural.

Golden Standard

Ease-Out (Decelerate)

`ease-out`

Enters at high velocity, then glides to a gentle, smooth stop. Feels responsive and natural to human eyes.

Delight

Spring / Bouncy

`cubic-bezier(...)`

Overshoots the destination slightly before settling, mimicking physical tension. Great for micro-interactions and likes!

Transition & Easing Physics Lab

Select a transition type, easing curve, and speed, then click "Play Transition" to see real CSS physics in action:

1. TRANSITION TYPE

Instant **Push** Modal Dissolve Morph

2. EASING CURVE

Linear **Ease-Out** Spring

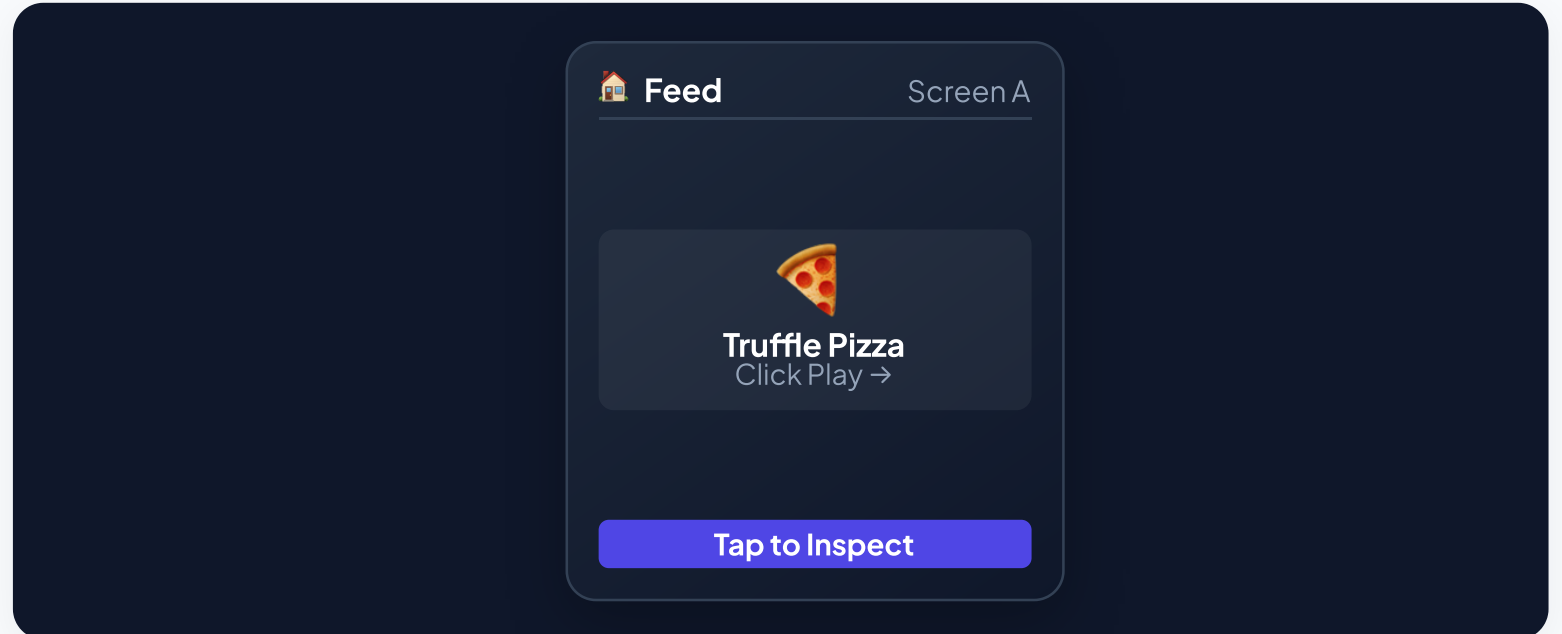
3. DURATION / SPEED

180ms (Fast) **350ms (Normal)** 900ms (Slow-Mo)

▶ Play Transition

Reset

CSS Motion Specs: transition: transform 350ms ease-out, opacity 350ms ease-out;



Creating a Simple Clickable Prototype: 5 Steps

Building a working clickable prototype requires a systematic 5-step methodology:

1. 1. Define the Core User Task Flow: Pick one specific goal (e.g., "User browses menu → selects pizza → customizes → places order → tracks delivery"). Avoid building 50 screens; build the happy path first!
2. 2. Design the Key Destination Frames: Create the 3 to 5 key screens in your UI tool with consistent status bars, typography, and buttons.
3. 3. Identify Clickable Hotspots: Select specific buttons, list items, or icons that will trigger user action.
4. 4. Connect Wires & Set Transitions: Link Hotspot → Destination Frame. Set appropriate transition (e.g., Push 300ms Ease-Out for navigation, Slide Up for modals).
5. 5. Test & Observe Real Users: Hand the phone prototype to someone who has never seen it. Watch where their finger taps without giving them hints!

Hotspots, Triggers, Actions & Backstack

The fundamental vocabulary of any clickable prototype:

Hotspot

The Target Area

The invisible or visible bounding box that listens for user interaction. Must be at least 48×48px on touchscreens for thumb reach.

Trigger

The User Input

What gesture activates it: On Tap, On Drag / Swipe, Hover, Long Press, or After Delay (for splash screens).

Action

The Response

What happens next: Navigate to Screen, Open Modal Overlay, Scroll to Anchor, or Trigger Sound/Haptic.

Backstack

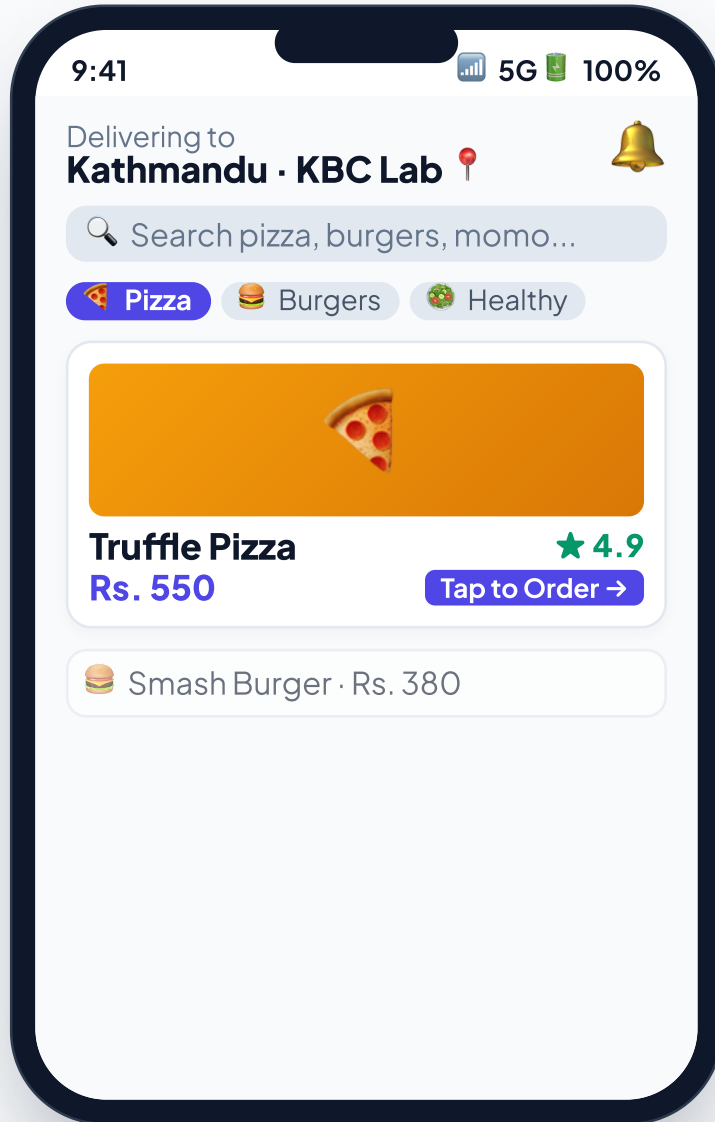
Back Navigation

Remembers the previous screen. When user taps the ← Back arrow, it automatically reverses the transition to return home.

§6.6 INTERACTIVE DEMO

Live Clickable Prototype - QuickBite App

A fully interactive 4-screen mobile flow. Tap buttons inside the phone to order food and track delivery:



Screen 1: Home Discovery

[Live Prototype](#)

This is a real interactive prototype running inside the slide. Tap interactive elements inside the phone to navigate through all 4 screens!

Figma Hotspot Highlighter

Shows glowing blue hints on all clickable targets

☐ Show Hotspots

💡 Teaching Cue: Clicking outside a hotspot briefly flashes the blue hint cues (just like Figma's prototype player does when a user misses a tap).

Golden Rules of Wireframing & Prototyping

Essential best practices to remember throughout your UI/UX design career:

✓ 5 Golden DO's

- Do start on paper: Always sketch 5–10 rough ideas with a pen before opening Figma.
- Do keep wireframes grayscale: Keep colors out of wireframes to focus purely on layout and hierarchy.
- Do test realistic user flows: Prototype the primary happy path from start to checkout.
- Do use natural easing: Use Ease-Out (250–350ms) for screens entering the view.
- Do test with real humans: Hand the prototype to users without speaking or helping them.

✗ 5 Critical DON'TS

- Don't fall in love with your first idea: Low-fi prototypes are meant to be tested and thrown away.
- Don't add colors to wireframes: Avoid arguing about hex codes when layout is still undecided.
- Don't build dead ends: Always include back buttons and close arrows in prototypes.
- Don't use robotic Linear easing: Constant-speed transitions feel mechanical and jarring.
- Don't write code before prototyping: Changing code takes weeks; changing a prototype takes 10 minutes.

Unit 6 Summary Cheat Sheet

Comprehensive quick-reference guide covering all 6 syllabus modules:

§6.1 Wireframes & Mockups

Skeletons & Visuals

Wireframe: Grayscale structural blueprint (layout, hierarchy).

Mockup: Static visual design (colors, typography, images, branding).

§6.2 Prototyping

Lo-Fi vs Hi-Fi

Lo-Fi: Paper & wireframes; fast, cheap, disposable concept tests.

Hi-Fi: Interactive, realistic simulation for user testing & handoff.

§6.3 UX Storyboard

Human Context

4-panel comic strip mapping real human context: Problem → Trigger → Product Action → Emotional Relief.

§6.4 Software Tools

Industry Stack

Figma: Cloud industry standard.

Framer: Code-like animation & web.

ProtoPie: Sensor & variable logic.

§6.5 Motion & Easing

Purposeful Motion

Push, Modal Slide, Dissolve, Smart Animate. Always use Ease-Out (250–350ms) for natural deceleration.

§6.6 Clickable Prototype

Interactive Flow

Hotspots (48×48px min) + Triggers (Tap, Drag) + Actions (Navigate, Overlay) + Backstack navigation.

TU BCA Exam Preparation Questions

Frequently asked questions in Tribhuvan University BCA UI/UX examinations:

Short Answer Questions (2–3 Marks)

- Define Wireframe. Why is it kept in grayscale?
- What is the main difference between a Mock-up and a Prototype?
- Explain why Low-Fidelity paper prototypes are preferred during early ideation.
- What is an interaction hotspot in prototype software?
- Why should designers avoid Linear easing for navigation transitions?

Long / Descriptive Questions (5–10 Marks)

- Differentiate between Wireframes, Mock-ups, and Prototypes with suitable examples and a comparison table.
- What is UX Storyboarding? Explain its 4 core stages with a real-world mobile app scenario.
- Describe the step-by-step process of creating a clickable prototype in modern UI software like Figma.
- Explain the significance of transitions and micro-animations in enhancing user experience.

Interactive BCA Exam Quiz

Test your understanding with 5 official exam-style questions. Click your answer for immediate feedback:

Score: 0 / 5

Single Best Answer

1. Which design artifact acts as the 'structural blueprint' focusing solely on layout and content hierarchy without colors or branding?

A. High-Fidelity Mockup

B. Wireframe

C. Interactive Prototype

D. Mood Board

Unit 6 Completed

← Unit 5: UI Design Considerations

↺ Restart Unit 6 Slides

Unit 7: Design Evaluations →