

Paper Code : U359-115 (TI) Civil  
U359-145 (TI) DT  
U359-135 (TI) GATE

U359-125 (TI) Comp  
U359-155 (TI) Mech

**OCTOBER 2019/ INSEM (T1)**

**T. Y. B. TECH. (Mechanical) (SEMESTER - I)**

**COURSE NAME: PRODUCT DESIGN AND ENGINEERING**

**COURSE CODE: IE31175ME**

**(PATTERN 2017)**

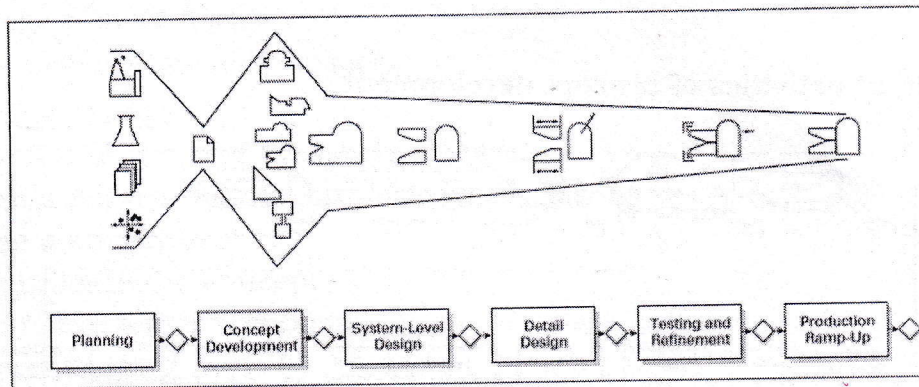
**Solution and Marking Scheme**

**Q.1.**

**a** Product development process -

Figure

[2 marks]



Explanation of each stages

[4 marks]

1. Planning & Concept development
2. System-level design
3. Detail design
4. Testing and refinement
5. Production ramp-up

**b** Definition of product design -

[2 marks]

Characteristics

1. Product quality -
2. Product cost -
3. Development time -
4. Development cost -

[1mark]

[1mark]

[1mark]

[1mark]

**c** Definition of innovative thinking

[2 marks]

Characteristics of good Innovator (any 4)

[2 marks]

- |                           |                       |
|---------------------------|-----------------------|
| 1. Think creatively       | 2. Take risk          |
| 3. Collaborate            | 4. Open minded        |
| 5. ask questions          | 6. Curious            |
| 7. Adaptable and flexible | 8. Confident          |
| 9. Think critically       | 10. Identify problem. |

OR

**Q.2.**

**a. Explain any 6 challenges faced during successful product development**

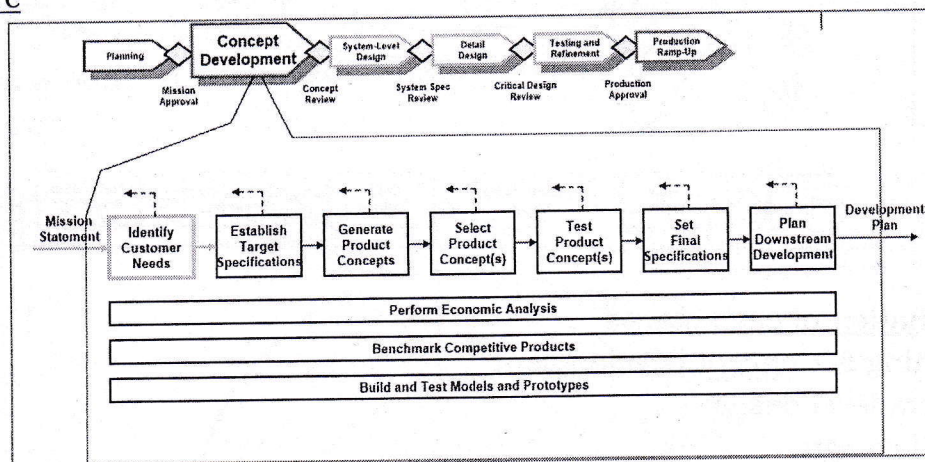
[6 marks]

1. Trade-offs
2. Dynamics
3. Details
4. Time pressure
5. Economics
6. Creation
7. Satisfaction of societal and individual needs
8. Team diversity
9. Team spirit

**b. Different activities of concept development:**

Figure

[2 marks]



Concept development activities

[4marks]

1. Identifying customer needs
2. Establishing target specifications
3. Concept generation
4. Concept selection
5. Concept testing
6. Setting final specifications
7. Project planning
8. Economic analysis
9. Benchmarking of competitive products
10. Modelling and prototyping

**c.**

Definition of Total fixed cost

[2 Marks]

Fixed costs are the costs that are independent of the number of goods you produce, or more simply the costs you incur when you do not produce any goods.



Definition of Total variable cost

[2 Marks]

These are just the opposite of fixed costs; these are the costs that do change when we produce more.

**Q.3**

**a.** Concept screening

[3 marks]

1. Prepare the selection matrix.
2. Rate the concepts.
3. Rank the concepts.
4. Combine and improve the concepts.
5. Select one or more concepts.
6. Reflect on the results and the process.

Concept testing

[3 marks]

1. Define the purpose of the concept testing
2. Choose a survey population and sample size
3. Choose a survey format
4. Communicate the concept
5. Measure customer response
6. Interpret the results

**b.** Procedure of setting target specification

[4 marks]

1. Identify a list of metrics and measurement units that sufficiently address the needs.
2. Collect the competitive benchmarking information
3. Set ideal and marginally acceptable target values for each metric (using at least, at most, between, exactly, etc.)
4. Reflect on the results and the process

**c.** Importance of reverse engineering

[4marks]

- To gain competitive benchmarking methods to understand competitor's products and develop better products
- The original CAD model is not sufficient to support modifications or current manufacturing methods
- The original supplier is unable or unwilling to provide additional parts
- The original equipment manufacturers are either unwilling or unable to supply replacement parts, or demand inflated costs for sole-source parts
- To update obsolete materials or antiquated manufacturing processes with more current, less-expensive technologies

OR

#### Q.4

a. Steps require to identify the proper customer Needs

- 1 Gather raw data from customers.
- 2 Interpret the raw data in terms of customer needs.
- 3 Organize the needs into a hierarchy of primary, secondary, and (if necessary) tertiary needs.
- 4 Establish the relative importance of the needs.
- 5 Reflect on the results and the process

[2 marks]

[1 mark]

[1 mark]

[1 mark]

[1 mark]

b. Process of setting final specification of product

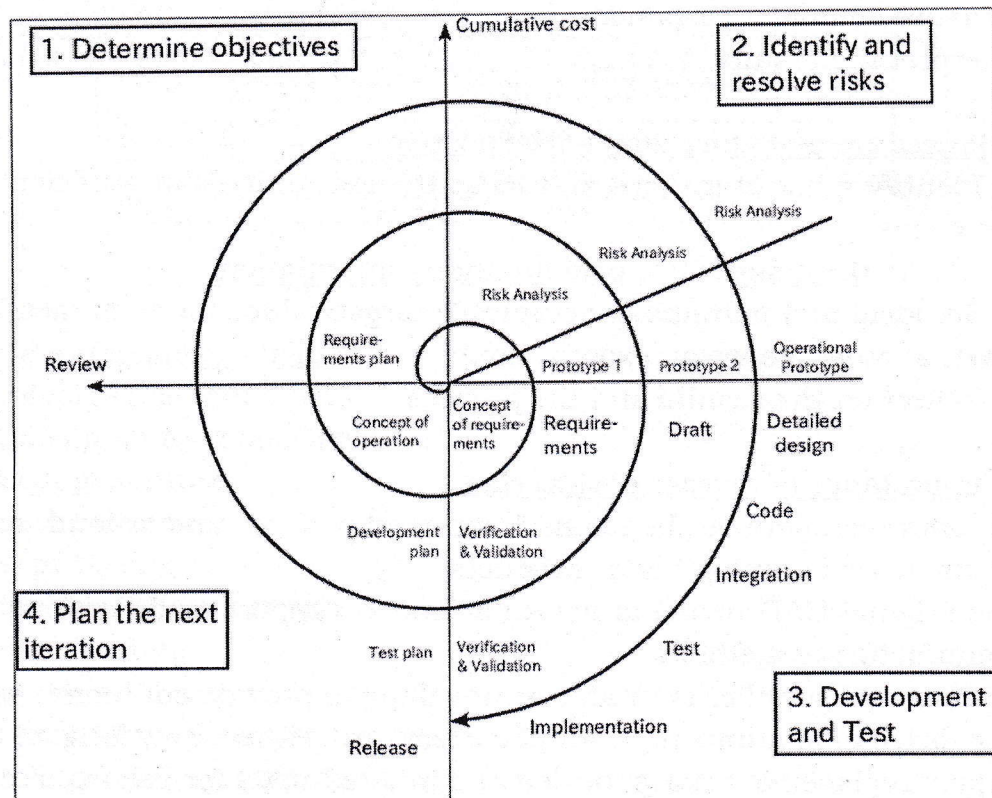
[4marks]

1. Develop technical models to access technical feasibility.
2. Develop a cost model of product.
3. Refine the specifications.
4. "Flow down" the final overall specs.
5. Reflect on the results.

c. Spiral product development process

[2 marks]

Figure



• Explanation

[2 marks]

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