NEW PRODUCT DEVELOPMENT
(MECH 3144)

Time Allotted : 3 hrs **Full Marks : 70**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and
<u>any 5 (five)</u> from Group B to E, taking <u>at least one</u> from each group.

Candidates are required to give answer in their own words as far as practicable.

Group – A
(Multiple Choice Type Questions)

1. Choose the correct alternative for the following: **10 × 1 = 10**

   (i) Reverse engineering of a product involves
   (a) engineering a product by following the steps in reverse
   (b) designing a product which is reverse of an existing product
   (c) extracting information from an existing product
   (d) designing a product from fundamental.

   (ii) Concurrent Engineering means
   (a) latest design
   (b) concept to manufacture
   (c) product modelling
   (d) doing design & manufacturing together.

   (iii) Patent right of a product is a
   (a) ethical matter   (b) legal issue
   (c) design consideration   (d) customer obligation.

   (iv) FAST is a method used for finding
   (a) product function   (b) customer needs
   (c) product assembly steps   (d) project facilities.

   (v) In order to make a product more difficult for copying by competitors, the product should have
   (a) modular architecture   (b) integral architecture
   (c) mixed architecture   (d) can have any architecture

   (vi) The fourth letter in the word PRIDE (principle of a product development team) is
   (a) devotion   (b) direction
   (c) discussion   (d) decision.

   (vii) Moore's law states that innovation in computing technology
   (a) remains constant   (b) increases at a constant rate
   (c) accelerates   (d) tops out (decelerate).

   (viii) The first full scale functional prototype of a product, constructed from actual materials as the final product is called
   (a) Alpha prototype   (b) Beta prototype
   (c) Gama prototype   (d) DOE prototype.

   (ix) The method used to define, analyse and understand product functions is known as
   (a) GEST   (b) BEST   (c) FAST   (d) CAST.

   (x) Which of the following can be categorised as "Design for Assembly" guideline
   (a) minimize part count   (b) maximise part symmetry
   (c) provide alignment features   (d) all of the above.

Group – B

2. (a) Elaborate on "Develop a concept", "Implement a concept" phases of a product development process.

   (b) What is reverse engineering and how does it help in product development?

   6 + 6 = 12

3. (a) Discuss on the basic characteristics that a Product development Team should possess. Mention the important roles of a Product Development Team.

   (b) Describe the 5 steps of Product Development Planning. What is the advantage of "integrated team" over "sequential functional team" for product development?

   (5 + 2) + (3 + 2) = 12

Group – C

4. (a) What is innovation cycle? Explain such cycle with an S-Curve for a product.

   (b) What are the difficulties in understanding customer needs? List and briefly elaborate the types of customer needs.

   (2 + 4) + (3 + 3) = 12

5. (a) Discuss about the different customer needs that require attention to remain competitive in the market?

   (b) What do you mean by function of a product? Giving a schematic diagram explain the function modelling and analysis process for developing a new product.

   6 + 6 = 12

Group – D

6. (a) Write the advantages and disadvantages of Modular Architecture and Integral Architecture.

   (b) Explain the "Modular Design by Clustering Method" through block diagram of a deskjet printer.

   5 + 7 = 12

7. (a) What is the goal of concept generation process? Elaborate on 4 steps of "Brain Storming".

   (b) What variables contribute to "manufacturing cost" of a product? How do you charge the cost of existing machinery to a new product that requires partial use of these machinery?

   (2 + 4) + 6 = 12

Group – E

8. (a) Discuss the advantages and disadvantages of analytical model and physical model for simulating a product's performance.

   (b) Describe the characteristics of Alpha, Beta and Preproduction prototypes. What is benchmarking process?

   6 + (4 + 2) = 12

9. (a) In the context of Design for Manufacture and Assembly of a product, explain with short note and relevant sketch the following
   (i) Design for Joining guideline (give 2 examples)
   (ii) Design for Assembly guideline (give 2 examples)
   (iii) Design for Manufacture guidelines (one example for sheet metal and one example for machined part)

   (b) What is the purpose of "Failure Mode & Effect Analysis"? Write the steps that can be taken to avoid product failure.

   (3 × 2) + (3 + 3) = 12