FUNDAMENTALS OF DESIGN AND MANUFACTURING

Time : Three hours

Maximum Marks : 100

Answer FIVE *questions, taking* ANY TWO *from* **Group A,** ANY TWO *from* **Group B** *and* ALL *from* **Group C.**

All parts of a question (a, b, etc.) should be answered at one place.

Answer should be brief and to-the-point and be supplemented with neat sketches. Unnecessary long answers may result in loss of marks.

Any missing or wrong data may be assumed suitably giving proper justification.

Figures on the right-hand side margin indicate full marks.

Group A

1. (*a*) Explain briefly various steps to be followed to design a product with the help of an example. 8

   (*b*) Discuss the following: 3×4

   (*i*) Design specifications

   (*ii*) Creative design

   (*iii*) Design by evolution.

2. (*a*) What do you mean by morphology of design? Explain briefly. 5

   (*b*) Explain various stages of a product life-cycle. What is its utility? 5

(*c*) Write a descriptive note on 'design checks for clarity, simplicity and safety.' 10

3. (*a*) What are the advantages and disadvantages of investment casting process? Mention some of its applications. 8

(*b*) What is sweep pattern? When is it used? 4

(*c*) Define the terms: (*i*) Sprue, (*ii*) Gate, (*iii*) Core, and (*iv*) Parting line. 4×2

4. Differentiate between the following: 4×5

(*i*) Hot working and cold working

(*ii*) Rolling and forging

(*iii*) Extrusion and wire drawing

(*iv*) Blanking and piercing.

Group B

5. (*a*) What is chip? What are the main types of chips formed during metal cutting? 8

(*b*) Define cutting speed, feed and depth of cut as applied to a shaping process. 4

(*c*) What is Merchant's circle diagram? Discuss its significance. 8

6. (*a*) Describe grinding process. What are the various factors considered during selection of grinding wheels? 8

(*b*) Compare the machining characteristics of different machining processes (such as EDM, ECM and USM) with respect to (*i*) metal removal rate, (*ii*) surface finish obtained, (*iii*) depth of surface damage, and (*iv*) power required for machining. 4×3

7. (*a*) What do you mean by Computer Aided Process Planning (CAPP) and state some of its advantages. Under what situations, CAPP is preferred as compared to manual process planning. 10

(*b*) Identify some of the benefits in integrating the design and manufacturing processes. What are the basic elements that go into making up a robotic cell for a particular application? 10

8. (*a*) What is gas welding? Explain different types of flames in oxy-acetylene welding. State their specific applications. 10

(*b*) Define group technology concept in manufacturing. Discuss the stages involved for adopting a plan for group technology. 10

Group C

9. Briefly explain the following: 10×2

(*i*) Selection of machine tools

(*ii*) Design for manufacturability

(*iii*) Database management

(*iv*) ASRS

(*v*) Concept of a system

(*vi*) Design for assembly

(*vii*) Brainstorming

(*viii*) Design specifications

(*ix*) Closed die forging

(*x*) Velocity of shear in metal cutting.