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. Select a product, such as the telephone or the television, and prepare sketches to describe how their appearances have changed from their inception to the present. What role has technology had in influencing these changes ? 20

2. (*a*) Explain how the systematic design process can aid in creating quality products. 8

   (*b*) What is the role of need analysis in the design process. Give one need statement for each of the following: 4×3

   (*i*) Bicycle

   (*ii*) Washing machine

   (*iii*) Personal Computer

   (*iv*) Private car

3. (*a*) What are main advantages of the casting process? What are its limitations and how are they overcome? 8

(*b*) Explain the following: 4×4

(*i*) Rolling

(*ii*) Extrusion

(*iii*) Blanking

(*iv*) Forging

4. (*a*) Define the term 'reliability' and 'maintainability'. Compare the reliability of systems with components in series *vs.* components in parallel. 10

(*b*) What is 'input-output' model? How will you use this model for a manufacturing process? What are the main factors on which the selection of a manufacturing process depends? 10

Group B

5. (*a*) What are the main types of chips formed during metal cutting? Why are non-homogenous chips formed? 6

(*b*) Define cutting speed, feed and depth of cut as applied to drilling. What are the major factors on which above three factors depend? 10

(*c*) What is cutting ratio? How can it be determined? 4

6. (*a*) How have integration and information technology influenced the fields of product design and manufacturing? 10

(*b*) What is group technology concept in manufacturing? What are the important benefits derived from it? 10

7. (*a*) 'Simulation is one type of modelling'— is it true? Discuss in detail. 6

(*b*) What are the main considerations to design a product by (*i*) a casting process, and (*ii*) forging process. 3+3

(*c*) What is computer aided process planning (CAPP)? What are the types of data required for developing a CAPP system? Differentiate between variant and generative systems of process planning. 8

8. (*a*) Explain the basic principle involved in electrochemical machining. 10

(*b*) Would electrochemical grinding be a suitable process for sharpening ceramic tools? Why or why not? What about using ultrasonics? 10

Group C

9. Briefly explain the following: 10×2

(*i*) Design by evolution

(*ii*) Problem identification

(*iii*) Design morphology

(*iv*) AGVs

(*v*) Gantry robots

(*vi*) Sensors

(*vii*) Robust design

(*viii*) Drawing and extrusion

(*ix*) Casting defects

(*x*) Hot and cold working.