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W'05 : 1 FN : AN 201/AD 301 (1401)

**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 supple-  
mented with neat sketches. Unnecessary long answers  
may result in loss of marks.*

*Any missing data 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 'Design Process'. Illustrate the step followed with the help of a figure. Also explain the flow of work during the design process. 2 + 2 + 4
- (b) Explain the role of 'need' in design. How the needs for a particular product design process analysed? 3 + 3
- (c) Describe the role of standardisation in the complex products. How the specifications help the customers? 3 + 3

(Turn Over)

2. (a) What do you understand by 'morphology of design'? Discuss the phases of feasibility study, preliminary design and detailed design. 3 + 5

(b) Explain the term 'Design for manufacturability'. State the guidelines to implement it. 4 + 2

(c) Describe the terms 'economic feasibility', 'recyclability' and 'evaluation of design'. 2 + 2 + 2

3. (a) What do you understand by 'reliability' and why it is considered? What are three categories of failures? Illustrate graphically number of failures vs. time. 2 + 2 + 2

(b) How will you check the design for clarity, simplicity and safety? Also explain how design is organised and communicated. 4 + 4

(c) Give the classification of manufacturing processes. Name the commonly used casting processes. With the help of a figure explain investment casting. 1 + 1 + 4

4. (a) Why should we do hot working of metals? Enumerate the advantages and disadvantages of hot working. Describe three high mill.  $1\frac{1}{2} + 2\frac{1}{2} + 4$  4

(b) Explain 'extrusion' and 'drawing' processes. 3 + 3 2

(c) Describe 'punching' and 'blanking' operations with the help of figures. 3 + 3 4

(viii) Centering can be done most accurately on

(a) four jaw chuck

(b) three jaw chuck

(c) collet chuck

(d) magnetic chuck.

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(c) Explain 'simulation' and 'database management system'. 3  
3+3

(B) Select the correct answers out of the alternative choices of the following: 1 x 8

8. (a) Enumerate and describe the important points to be considered at the time of design for easier machining of a component. 8

(i) Steel and cast iron pipes are casted by

(a) die casting

(b) continuous casting

(c) centrifugal casting

(d) investment casting

(b) Write notes on the following: 8

(ii) Facing sand used in foundry work comprises

(i) Controllers

(ii) Sensors

(iii) Robots

(iv) Automated guided wheels.

(a) alumina, silica and clay

(b) silica and clay

(c) clay and alumina

(d) silica and alumina

(c) (i) How will you consider the economic aspects for manufacturing during design? 2

(ii) Describe computed aided process planning. 2

(iii) The criteria for selection of electrode diameter in arc welding is

(a) type of welding process

(b) thickness of the components to be welded

(c) voltage used

(d) current used

9. (A) Explain the following in brief: 2 x 6

(i) Brain storming

(ii) Forging

(iii) Design for assembly

(iv) Robust design

(v) Design for shipping

(vi) Safety in design.

(iv) In arc welding, arc is created between electrode and work by

(a) flow of current

**Group B**

- (b) voltage
  - (c) contact resistance
  - (d) electrical resistance
- (v) Hot working improves the mechanical properties of the metal due to
- (a) recovery of grains
  - ✓(b) recrystallisation
  - (c) grain growth
  - (d) refinement of grain size
- (vi) In four high rolling mill the bigger rollers are called
- (a) guide rolls
  - (b) back up rolls
  - ✓(c) main rolls
  - (d) support rolls
- (vii) In drawing operation, the metal flows due to
- ✓(a) ductility
  - (b) work hardening
  - (c) plasticity
  - (d) shearing

5. (a) How do you define the cutting ability of a cutting tool? Give the classification of cutting tools. How will you select the materials of a cutting tool?  $2\frac{1}{2} + 2\frac{1}{2} + 3$
- (b) Classify the machining processes. Name the operations which can be performed on a lathe machine. Describe the process to carry out the turning operation on the lathe machine.  $2 + 2 + 4$
- (c) Differentiate between the shaper and planer. Explain what process takes place during the return stroke of a shaping machine.  $2 + 2$
6. (a) Describe the working principle of 'arc welding'. Explain the shielded arc welding and how does it save the weldment from oxidation and absorption of nitrogen. What precautions need to be observed in arc welding?  $2 + 4 + 2$
- (b) Enumerate the advantages of unconventional machining methods. Describe the working of electro-discharge machining with the help of a figure.  $3 + 5$
- (c) Define information. Enumerate the facts about information. How will you build up information system?  $1 + 1 + 2$
7. (a) What do you understand by 'Group Technology'? Enumerate the advantages and disadvantages of group technology.  $3 + 5$
- (b) Discuss the use of classification system of group technology. Also discuss the application of cluster analysis.  $3 + 3$