B. Tech.

(SEM. IV) EXAMINATION,  2006-07

MANUFACTURING SCIENCE - I

Time : 3 Hours]  Total Marks : 100

Note :  (1)  Attempt all 5 questions as instructed therein.
(2)  There are choices within. Marks are indicated therein. Answer briefly.

1  Answer part (d) and any two more parts from the remaining :
   (a)  What do you understand by yield criteria?  5
        Explain Tresea's yield criteria and compare it
        with Von-Mises' yield criteria.
   (b)  What are the advantages of open-die and
        closed-die forging process? Explain open-die
        forging process in brief.
   (c)  Explain some advantages and disadvantages
        of cold working in light of hot working.
   (d)  Derive a relation to determine the forging
        force for forging of rectangular strip with
        sticking friction condition.

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2  Answer part (d) and any two more parts from the remaining:
   (a) What is the difference between drawing and extrusion? What types of defects may occur in drawing and extrusion?
   (b) Derive expression for drawing stress \( \sigma_{xa} \) for wire drawing through a conical die of die angles 2 \( \alpha \) and coefficient of friction \( \mu \), as
       \[
       \sigma_{xa} = \frac{1 + B}{B} \left[ 1 - \left( \frac{D_a}{D_b} \right)^{2B} \right]
       \]
       where \( B = \mu \).
   (c) Explain in brief major effect of friction in forming operations and also the role of lubrication in forming operations.
   (d) What do you mean by friction hill rolling? Derive a relation to determine roll separating force.

3  Answer any four parts:
   (a) On what factors the selection of press for sheet metal forming operation depend?
   (b) Describe the difference between compound and progressive dies. Illustrate with sketch and an example.
   (c) With the help of neat diagram explain in brief the deep drawing operation.
   (d) What are different types of press? Explain any one.
   (e) Explain flat-face and inclined face punch with neat sketches.

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4 Answer any four parts:
(a) What are the different methods by which high energy release rates can be obtained? Explain in brief.
(b) List the different operations in sequence for powder metallurgy process. Explain in brief "sintering".
(c) Why is there a need for flexible fixturing for holding work pieces? Are there any disadvantage? Explain.
(d) Explain the important mechanical and physical properties of plastics and its uses.
(e) Write short notes on any two of the followings:
(i) Principles of jigs and fixtures
(ii) Electro-hydraulic forming
(iii) Welding of plastics

5 Answer any four parts:
(a) What are different types of patterns? Explain single piece pattern.
(b) Explain 'riser' and 'runner' as related to castings and compare riser versus runner.
(c) Explain the essential properties of a moulding sand.
(d) Explain in brief the mechanics of solidification of casting of pure metals.
(e) Explain in brief the Die casting methods.
(f) Sketch and briefly describe Cupola furnace.