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B.TECH.
(SEM IV) THEORY EXAMINATION 2018-19
MANUFACTURING SCIENCE & TECHNOLOGY-I

Time: 3 Hours ***Total Marks: 70***

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. 2 x 7 = 14

a. Classify the manufacturing system.
b. Define the term strain hardening and warm working.
c. Define the term degree of drawing and extrusion ratio.
d. What do you mean by Aspiration effect?
e. Define deep drawing and redrawing.
f. Define spring back and bending allowance.
g. Write down the principle of high energy rate forming (HERF) process.

SECTION B

2. Attempt any *three* of the following: 7 x 3 = 21

a. Derive the expression for pressure distribution in forging of rectangular block of size *b x h x w* under striking friction condition $\frac{P}{2K} = 1 - \frac{1}{h}\left(x - \frac{b}{2}\right)$.

b. Show that the drawing stress σ_d in case of wire drawing with applied back tension σ_b can be expressed as $\sigma_d = \sigma_y \left(\frac{1+B}{B}\right)\left[1 - \left(\frac{r_a}{r_b}\right)^{2B}\right] + \sigma_b \left(\frac{r_a}{r_b}\right)^{2B}$,

Where B = μcotα, μ be the coeff. of friction, α is the semi die angle,
σ_y is the yield strength of wire material in tension,
r_a and r_b are the radius of the wire at exit and inlet respectively.

c. A 100 mm diameter is to be punched in a steel of 6 mm thick. The material is cold rolled C40 steel for which the maximum shear strength can be taken as 550 MPa, with normal clearance on the tool, cutting is complete at 40% penetration of the punch. Give suitable diameters for punch and die, and shear angle on the punch in order to bring the work within the capacity of a 200KN press available in the shop.

d. Explain the pattern allowances. Design a sprue to avoid Aspiration effect the discharge of the molten metal through the sprue is 20Kg/sec. take density of the material as 7800 kg/m$^{3.}$ The height of pouring basin is 90mm and height of the sprue is 25 cm.

e. Define the term Plastic. Explain injection moulding of plastic section. Also write down the limitation of injection moulding.

SECTION C

3. Attempt any *one* part of the following: 7 x 1 = 7

(a) Differentiate hot working and cold working. Also explain advantages of metal forming processes over other manufacturing processes.

(b) A 200 mm wide 500mm long and 10 mm thick strip is compressed between two flat dies in plain strain such that the dimension 500 mm remains constant. The coefficient of friction between dies and the strip is 0.1 and yield strength of material in compression is 200N/mm^2. Determine the mean die pressure and maximum die pressure.

4. Attempt any *one* part of the following: 7 x 1 = 7

(a) A metal strip is to be rolled from an initial thickness of 3.5 mm to a final rolled thickness of 2.5 mm in a single pass rolling mill having rolls of 250 mm diameter. The strip is 450mm wide. The average coeff. of friction in the roll gap is 0.08. Taking plain strain flow stress of 140 MPa for the metal and assuming negligible spreading, estimate the roll separating force.

(b) Calculate the drawing load required to obtain 30% reduction in area on a 14mm diameter copper wire. The following data is given $\alpha = 10^0$, $\mu = 0.1$, $\sigma_0 = 260$ N/mm^2. Also calculate the power of the electric motor if the drawing speed is 3.0 m/s. Take motor efficiency as 97%.

5. Attempt any *one* part of the following: 7 x 1 = 7

(a) 150 mm diameter and 82 mm deep cup shaped component with 10 mm wide flange on the periphery are to be manufactured out of aluminum sheet of thickness 1 mm. The ultimate strength of the sheet in tension is 120N/mm^2. Determine the blank size and blank holding pressure. The corner radius both at rim and at the bottom is equal to 6mm.

(b) Classify the cutting dies. Also explain working of combination and progressive dies.

6. Attempt any *one* part of the following: 7 x 1 = 7

(a) Explain the elements of gating system.
A solid cylinder of diameter 'D' and height equal to 'D' and solid cube of side 'L' are being sand cast by using the same material. Assuming there is no superheat in both the cases calculate the ratio of solidification time of the cylinder to the solidification time of cube.

(b) With the help of neat sketch explain centrifugal casting with their applications.

7. Attempt any *one* part of the following: 7 x 1 = 7

(a) Explain 3-2-1 principle. Also explain Milling fixture wit help of neat sketch.

(b) Explain electromagnetic and electrohydraulic forming.