MME, 1st yr. 2nd Sem. Examination, 2024

Subject: Manufacturing Aspects of Design

Time: three Hours *Full Marks: 100*

Answer any five questions (any missing data may be assumed)

1. i) A 230 mm wide6061-O aluminum strip is rolled from a thickness of 25 mm to 20 mm. If the roll radius is 305 mm and the roll rpm is 100, estimate the total horsepower required for this operation.

   ii) Why long holes are avoided in castings? Give reasons in design point of view.

   [12+8]

2. i) A medium carbon steel billet 150 mm in diameter, 300 mm long is extruded at 1000 deg. C. at a speed of 300 mm/s. using square die and poor lubrication, the force required if final diameter is 75 mm.

   ii) Sometimes ribs are introduced in castings; describe the proper justification for design point of view.

   [12+8]

3. In non-dimensional pressure distribution along the roll length, show that how neutral point shifts in different coefficient of friction. Will you accept this as design point of view? [20]

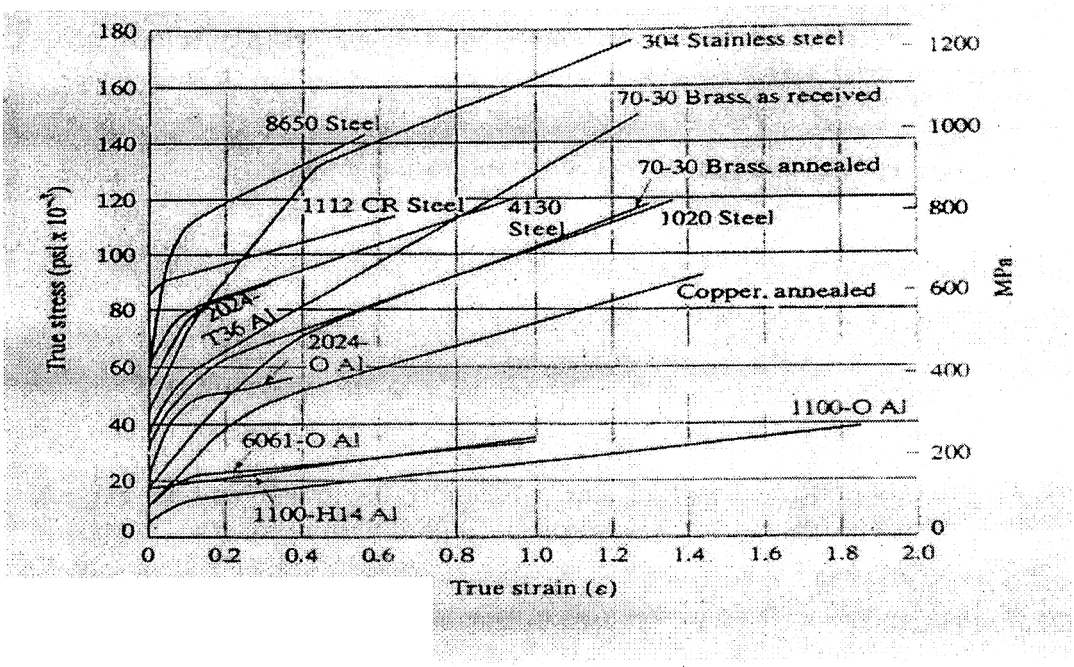
4. In flat rolling, taking larger reductions than the smaller one in one pass is better; explain it in design point of view. Also discuss how mechanical properties improve in cold rolling compared to casting or machining. [20]

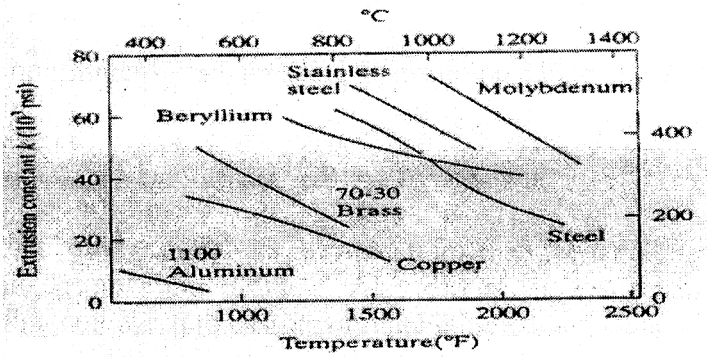
5. i) Why surface-cracks found in extrusion? ii) How would you go about avoiding surface cracking defects in extrusion? iii) Explain why your methods would be effective in design point of view. [6+8+6]

6. i) Explain the advantages and limitations of using small diameter rolls in flat rolling. ii) Rolling reduces the thickness the plates and sheets. However, it is also possible to reduce the thickness by simply stretching the material. Would this process be feasible? Explain.

   [10+10]

7. i) How would you eliminate the undercuts in during casting? Explain. ii) What is the effect of internal stresses in casting? [10+10]





Typical Values for K and n in Eq. (2.11) at Room Temperature

Material	K (MPa)	n
Aluminum, 1100-O	180	0.20
2024-T4	690	0.16
5052-O	210	0.13
6061-O	205	0.20
6061-T6	410	0.05
7075-O	400	0.17
Brass, 70-30, annealed	895	0.49
85-15, cold rolled	580	0.34
Bronze (phosphor), annealed	720	0.46
Cobalt-base alloy, heat treated	2070	0.50
Copper, annealed	315	0.54
Molybdenum, annealed	725	0.13
Steel, low carbon, annealed	530	0.26
1045 hot rolled	965	0.14
1112 annealed	760	0.19
1112 cold rolled	760	0.08
4135 annealed	1015	0.17
4135 cold rolled	1100	0.14
4340 annealed	640	0.15
17–4 P–H, annealed	1200	0.05
52100 annealed	1450	0.07
304 stainless, annealed	1275	0.45
410 stainless, annealed	960	0.10

Note: 100 MPa = 14,500 psi.