

Oct 2018 / In-SEM (T2)

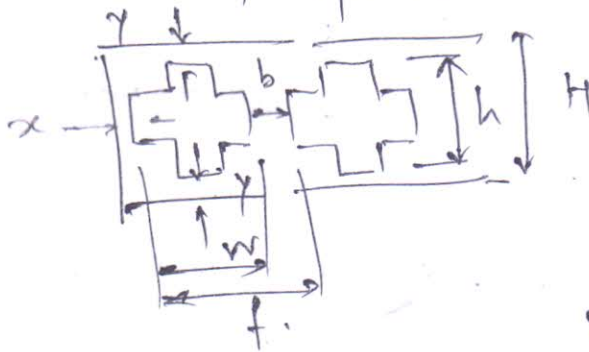
S.Y.B.Tech. (Mechanical Engg.) Csem-I

Course Name: Manufacturing Processes

Course code: MEUA21173

(Pattern 2017)

Q.1 (a) strip layout:- (1 mark)



$$y = t + 0.015h$$

$$y = 1.2 + 0.015 \times 60 = 2.1 \text{ mm}$$

$$x = 1.2 \text{ mm}$$

$$H = h + 2y = 64.2 \text{ mm}$$

$$\text{Feed, } f = w + x = 61.2 \text{ mm}$$

$$\% \text{ utilization} = \frac{\text{Total Blank cut area}}{\text{Area of uncut strip}} \times 100$$

$$= \frac{60 \times 60 - (4 \times 20 \times 20)}{64.2 \times 61.2} \times 100$$

$$= 50.9\% \quad (2 \text{ marks})$$

Center of pressure = (30, 30) - Part is symmetric @ x and y axis. (1 mark)

Press capacity, $F = (\text{Perimeter} \times \text{thickness}) \times \text{ultimate shear strength}$

$$F = (12 \times 20 \times 1.2 \times 220) = 63.36 \text{ kN}$$

(2 marks)

b) Amount of shear on the punch (I) = $\frac{k \cdot t \cdot (F_{\text{max}} - F)}{F}$

k - % penetration = 0.45

I - Shear on punch.

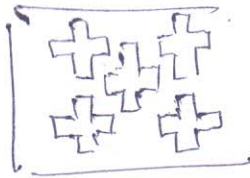
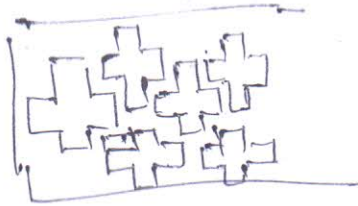
$$F_{max} = 63.36 \text{ kN (for q.f.c) problem)}$$

$$F = \frac{1}{2} F_{max} = \frac{1}{2} \times 63.36 = 31.68 \text{ kN}$$

$$\therefore I = \frac{0.45 \times 1.2 \times (63.36 - 31.68)}{31.68}$$

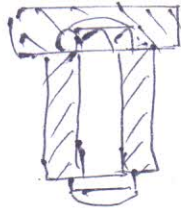
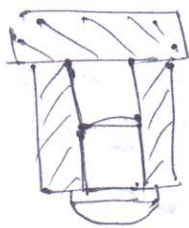
$$\therefore \text{shear on punch} = \underline{0.54 \text{ mm}} \quad (4 \text{ marks})$$

% utilization can be increased by designing strip as below:



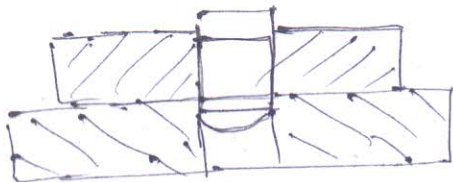
(2 marks)

e) 1) Direct pilots — are placed on the face of the punch



(2 marks)

② Indirect pilots — Not fixed at the bottom of the blanking punch. This punch is directly retained in the punch holder.



(2 marks)

$$Q.2(a). d/h \text{ ratio} = 50/1.6 = 31.25 > 20$$

$$\therefore D = \sqrt{d^2 + 4dh} = \sqrt{50^2 + 4 \times 50 \times 70} = 128.45 \text{ mm} \quad (1 \text{ mark})$$

$$\text{Trimming allowance} = (50 \times 3.2)/25 = 6.4 \text{ mm}$$

$$\text{Size of the blank} = 128.45 + 6.4 = 134.85 \text{ mm}$$

$$\% \text{ reduction} = 100 (1 - d/D) = 100 (1 - 50/134.85) = 62.92\%$$

A reduction of 50% is possible in the first draw & hence more than one draws are required.

No. of draws reqd: (h/d) ratio $= 70/50 = 1.4$ therefore

No. of draws reqd: 2 (1 mark)

% reduction for Ist draw = 50%.

$$\text{dia. 'd' at first draw} = 134.85 - (0.5 \times 134.85) \\ = \underline{57.425 \text{ mm}}$$

Dia. at the second draw has to be 50 mm, therefore reduction for second draw $(1 - \frac{50}{57.425}) \times 100 = 12.92\%$

which is less than the permissible reduction at IInd draw

$$\text{clearance} = 1.15 \times 1.2 = 1.38 \text{ mm/side}$$

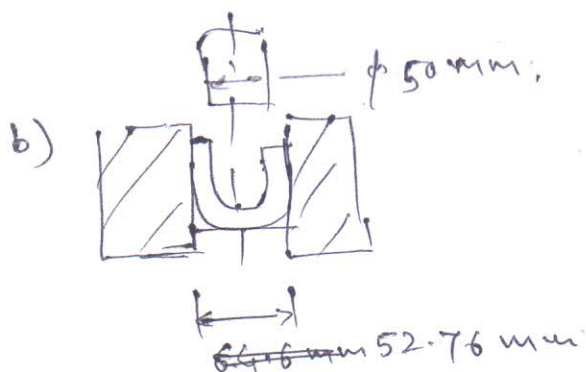
punch dimension for IInd draw = 50 mm

$$\text{Die opening dia. for IInd draw} = 50 + 2 \times 1.38 = 52.76 \text{ mm}$$

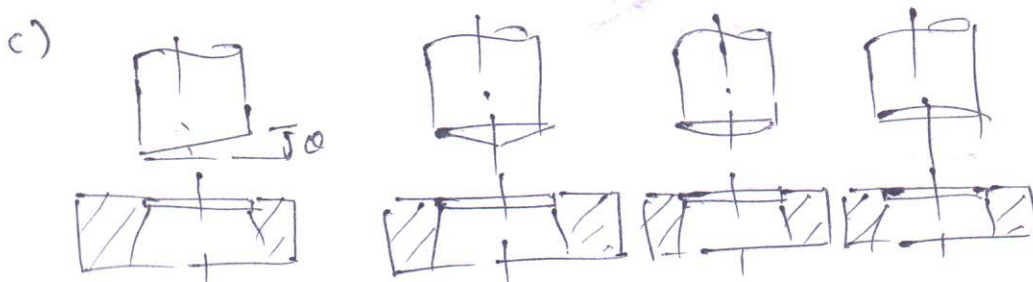
$$\text{punch dia. for the first draw} = 57.425 \text{ mm}$$

$$\text{Die dia. for the first draw} = 57.425 + 2 \times 1.38 = 60.185 \text{ mm.}$$

(1 x 4 = 4 marks)



(6 marks)



(1 x 4 = 4 marks)

Q.3. a) ~~working~~ working of blow moulding — (3 marks)
Schematic — explaining the steps — (3 marks)

b) Vacuum thermoforming

A sheet of plastic material is heated to pliability, then passed against a 3D mould by vacuuming out the air betⁿ the sheet and the mould.

pressure thermoforming

A sheet of plastic material is heated to pliability, then passed against a 3D mould by vacuuming out the air betⁿ the sheet & mould and applying air pressure above the sheet.

a) Mostly suitable for undercuts & tighter tolerances.

Mostly for complex shapes & pieces with vents.

c) Chair — Injection moulding

Car dash board — // —————>

plumbing fittings — Extrusion

Cosmetic packaging — // —

Food & water bottles — Blow moulding

Automobile fuel tanks — // —

Luggage bags — Vacuum thermoforming

Refrigerator inner panels — // —

(8 x 0.5 = 4 marks)

Q.4 a) Transfer moulding

Sketch (3 marks)

Explain (3 marks)

b) ~~working~~ end.

Q-4(b)

	<u>Injection moulding</u>	<u>Compression moulding</u>
Tooling cost	High	medium
Rate of production	High	medium
quality of surface	Good	Good
Type of plastic used	Thermoplastic	Thermosetting

c) Thermoplastics -

- ① Gears, ② Dishes,
- ③ Container tops & fittings
- ④ Washing m/c agitators
- ⑤ Toilet goods

Thermosetting

- ① Electric plugs, ② Electronic components with moulded terminals, ③ Telephones receivers