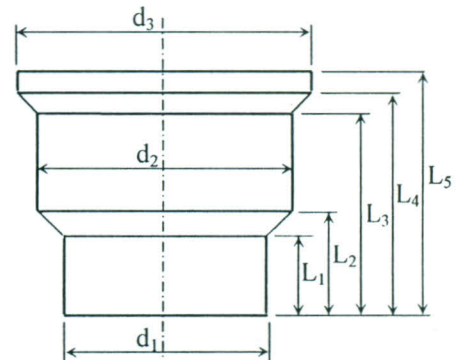


First Question: (25 marks)

a) Prove analytically that the depth (P_2) of a flat form tool with positive rake angle is in the form:

$$P_2 = \{ \sqrt{r_2^2 - (r_1 \sin \gamma)^2} - r_1 \cos \gamma \} \cos(\gamma + \alpha) \quad (10 \text{ marks})$$

b) Graphically find the diameter and profile of the circular form tool required to produce the product shown in figure. This tool is to have 15° front clearance angle and 5° positive rake angle. Given are: $d_1=20$ mm, $d_2=30$ mm, $d_3=40$ mm, and L_1, L_2, L_3, L_4, L_5 are 30, 35, 70, 75 and 80 mm. Take “k” as 8mm and “m” between 6-8 mm. (15 mark)

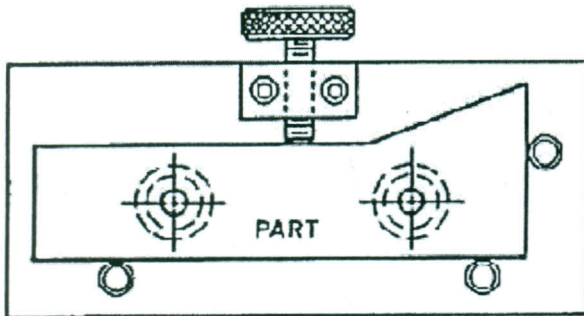


Second Question: (20 marks)

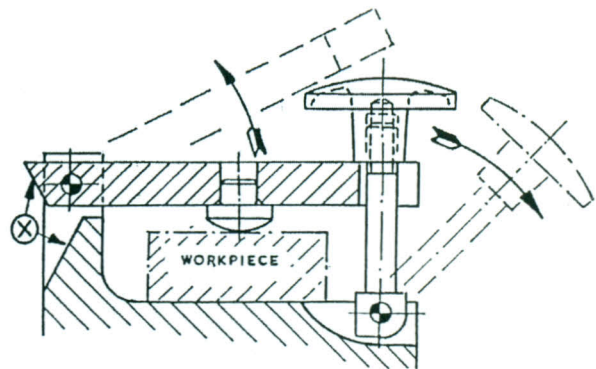
A face milling cutter with 120 mm diameter and 18.85 mm circular pitch is used to mill a workpiece with 81 mm width. For symmetrical milling action, graphically find the full contact angle “ δ ” and the number of teeth simultaneously in contact.

Third Question: (15 marks)

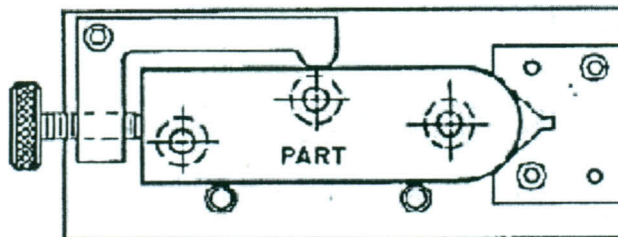
Find out the lever system used in a, b and c of the following figure. Also, write the relationship between the applied force and the workpiece clamping force. (5 marks each)



(a)



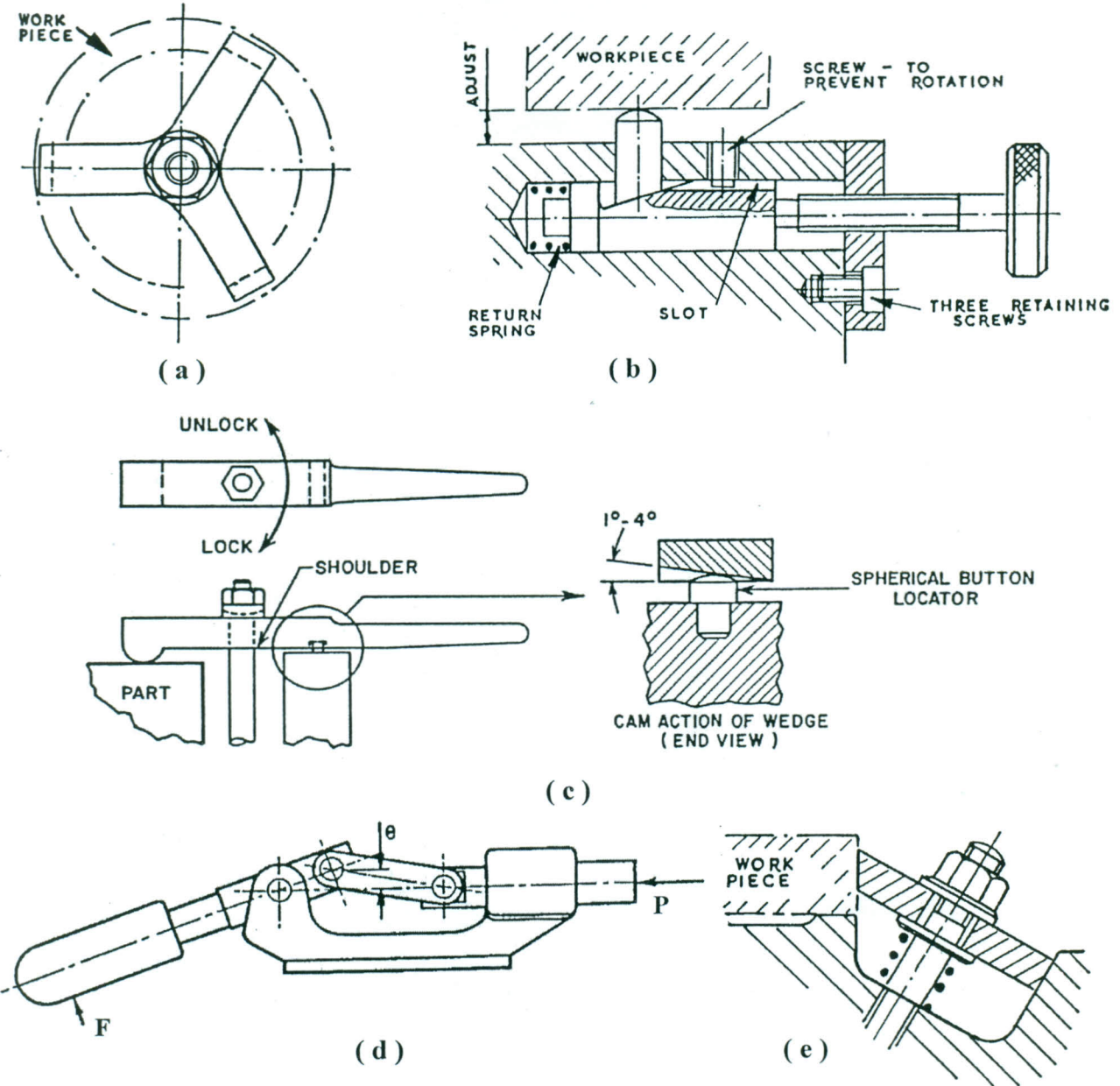
(b)



(c)

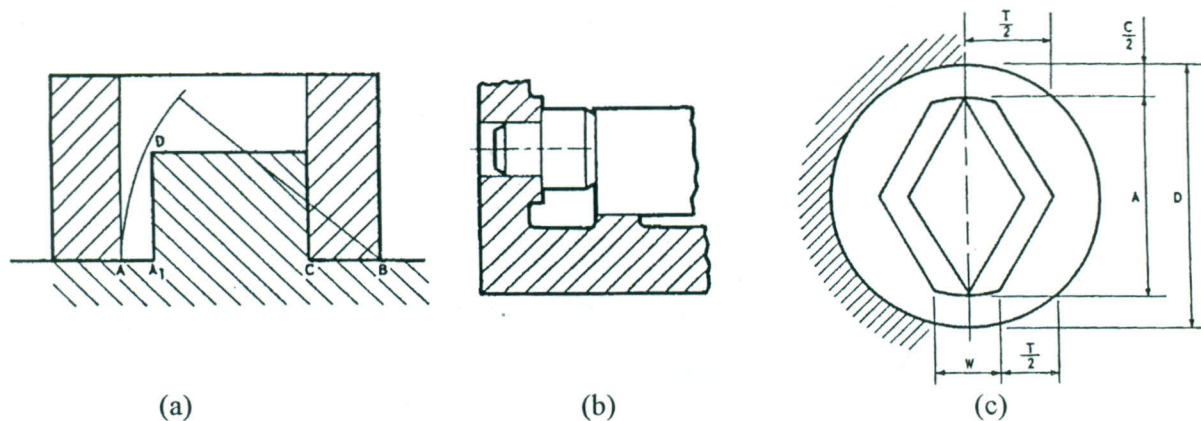
Question 04: (15 mark)

Name only the following figures with their suitable locating or clamping system. (5 marks each)



Question 05: (15 marks)

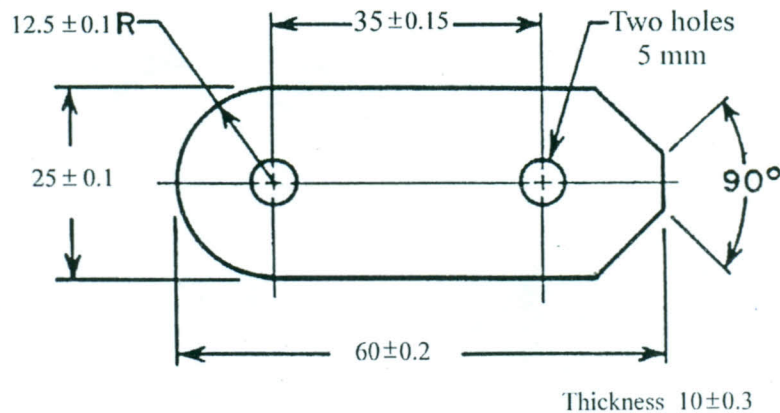
Choose the correct title from 1, 2, 3, 4, 5, 6, 7, and 8 to fit the figures a, b, and c. (5 marks each)



- 1) Jam-free circular locator in combination with a flat locating surface
- 2) A cylindrical locator with triangular relief to minimize jamming
- 3) The geometry of the diamond pin
- 4) Jam-free non-cylindrical circular locators
- 5) The significant dimension of a jam free circular locator
- 6) A simple locating pin used as a side stop.
- 7) A simple locating pin used as a side stop, with relieved bearing area in fixture base.
- 8) A button used as a pin for a side stop.

Question 06: (20 marks)

To drill the two holes of 5 mm in diameter for the workpiece shown in figure, using the principle design of Vee pad and pins only, draw the required locating system. **The draw must be with suitable scale.**



Good Luck