



## UNIVERSITY COLLEGE TATI (UC TATI )

## FINAL EXAMINATION QUESTION BOOKLET

COURSE CODE	: BME 2123
COURSE	: TOOLING DESIGN
SEMESTER/SESSION	: 1-2022/2023
DURATION	: 3 HOURS

Instructions:

1. This booklet contains 4 questions. Answer ALL questions.
2. All answers should be written in answer booklet.
3. Write legibly and draw sketches wherever required.
4. If in doubt, raise up your hands and ask the invigilator.

**DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO**

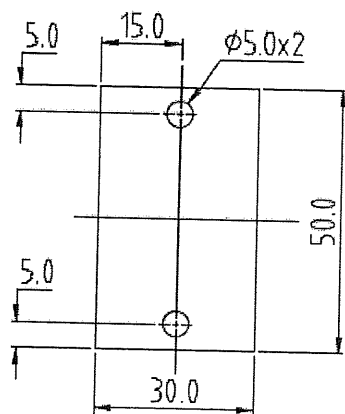
**THIS BOOKLET CONTAINS 5 PRINTED PAGES INCLUDING COVER PAGE**

**PART A (PRESS TOOL)****QUESTION 1**

- a) **Explain** the term "Theory of Shearing". (4 marks)
- b) **Describe** critical stages of shearing? (3 marks)
- c) **Discuss** the different between wide layout and narrow layout of strip layout. Sketch the diagram to support your answer. (6 marks)
- d) **Classify** 3 factors that should be considered when designing the die block. (3 marks)
- e) **Give example** and sketch THREE of the methods on how to reduce the cutting force. (9 marks)

**QUESTION 2**

- a) **State** the reason that the component has to be studied first before further process of designing the tool? (5 marks)
- b) **Sketch** the strip layout for the component which shown in **Figure PT1** and state clearly the process of producing the part. (6 marks)

Specifications:-

1. Material : Steel 0.6%
2. Thickness: 1 mm
3. Tmax: 40 kg/mm<sup>2</sup>

**Figure PT1 Bracket**

c) **Calculate** the following requirements for designing the tool for Figure PT1.

Refer to Appendix 1 to answer these questions.

- i. Economic factor (use scrap bridge 2.5 mm) (4 marks)
- ii. Total cutting force to shear the component. (6 marks)
- iii. Cutting clearance (use  $c = 0.01$ ). (4 marks)

## PART B (MOULD)

### QUESTION 3

- a) Referring to the **Figure PT2** below, briefly **describe** the function of each component of injection moulding machine tagged. (10 marks)

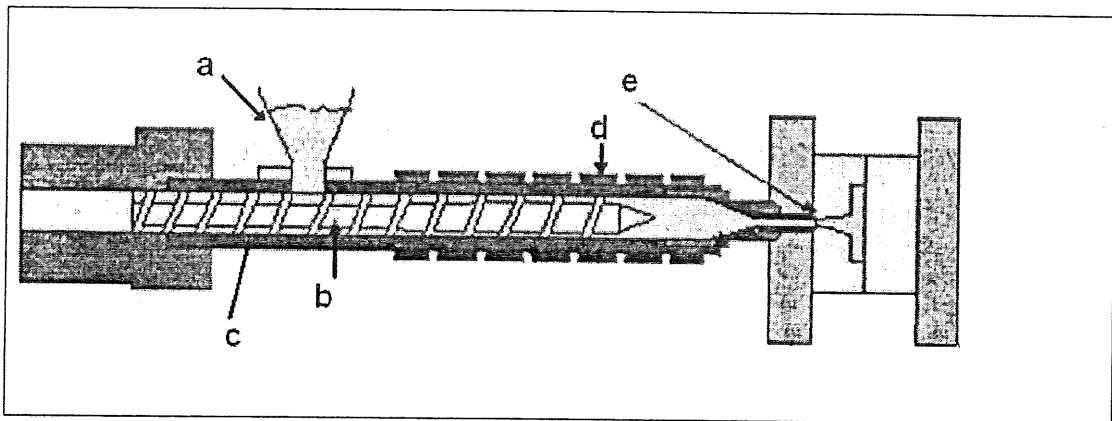


Figure PT2

- b) Calculate the shrinkage for the component in the Figure PT3 (7 marks)

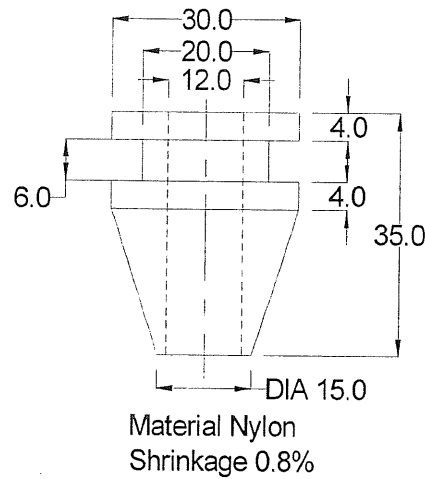


Figure PT3

- c) Differentiate the terms single daylight and two daylight mould. State both of the terms and briefly explain. (8 marks)

#### QUESTION 4

- a) What is feed system of the mould? Explain with neat sketch. (6 marks)

- b) Clarify the function of the following parts of the mould:

- i. Register ring / Locator ring
- ii. Ejector pin
- iii. Spacer block (6 marks)

- c) What is the runner system in moulding? List down the types of runner system available.

(7 marks)

- d) Describe the common defects occurs to the moulding product. (6 marks)

-----End of question-----

#### RUBRIC

Criteria	MARKS
All questions answered will be marked according to the answer scheme	/100

**APPENDIX 1 (For Press Tool calculations)****Side Scrap and Scrap Bridge**

Sheet Thickness (mm)	Strip Width (mm)			
	Up to 10	10 - 50	50 - 100	100 - 150
0.5	1.5	2.0	3.0	3.5
1.0	1.0	1.75	2.0	2.5
1.5	1.5	2.0	2.5	3.0
2.0	2.0	2.5	3.0	3.5
3.0	2.0	3.5	4.0	4.5

**Economic Factor**

$$\text{Economic Factor (E.F)} = \frac{\text{Area of blank} \times \text{No. of row} \times 100}{\text{Width of strip} \times \text{Pitch}}$$

**Cutting/Shearing Force, F**

$$\text{Cutting/Shearing Force, } F = l \times s \times \tau_{\max}$$

where,

$$l = \text{length of periphery to be cut in mm}$$

$$s = \text{stock thickness in mm}$$

$$\tau_{\max} = \text{shear strength in N/mm}^2$$

**Cutting Clearance for sheet thickness up to 3 mm**

$$\text{Clearance (for one side)} = C \times s \times \sqrt{\left(\frac{\tau_{\max}}{10}\right)}$$

**Cutting Clearance for sheet thickness above 3 mm**

$$\text{Clearance (for one side)} = (1.5 \times C \times s - 0.015) \times \sqrt{\left(\frac{\tau_{\max}}{10}\right)}$$

where,

$$C = \text{a constant} = 0.01$$

$$s = \text{stock thickness in mm}$$

$$\tau_{\max} = \text{shear strength in N/mm}^2$$

