

# TRANSLATION

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## UNIVERSITI SAINS MALAYSIA

Second Semester Examination  
Academic Session of 2005/2006

April/May 2006

### **EBP 402/3 - Mould & Die Design**

Time : 3 hours

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Please ensure that this paper consists of SEVEN printed pages before you proceed with the examination.

This paper contains SEVEN questions, THREE questions in SECTION A and FOUR questions in SECTION B.

Answer any FIVE questions. Answer all questions in SECTION A and answer any TWO questions in SECTION B. If a candidate answers more than five questions, only the first five answered will be examined and awarded marks.

Answer to any question must start on a new page.

All questions must be answered in Bahasa Malaysia.

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3. [a] Adequate hardness, high strength and good machinability are among the important parameters in selecting mould materials for plastic processing. Outline your comments on how the three properties of material influence the mould material of your choice.

(30 marks)

- [b] Typical properties of H13 PQ tool steel are listed in Table 1. Based on the properties listed, outline typical applications of this steel with respect to the mould and die materials for plastic processing.

(30 marks)

**Table 1: Properties of Steel H13 PQ**

Hardness, Rockwell C	46
Tensile strength, Ultimate	1500 MPa
Tensile strength, Yield	1410 MPa
Modulus of Elasticity	207 GPa
Elongation, Yield	13%
CTE, Linear 100°C	11.3 $\mu\text{m}/\text{m}\cdot^\circ\text{C}$
Thermal conductivity	17.6 W/m-K
Charpy Impact	25.8J

- [c] Outline five reasons why aluminium alloy mould tools are better than steel mould tools.

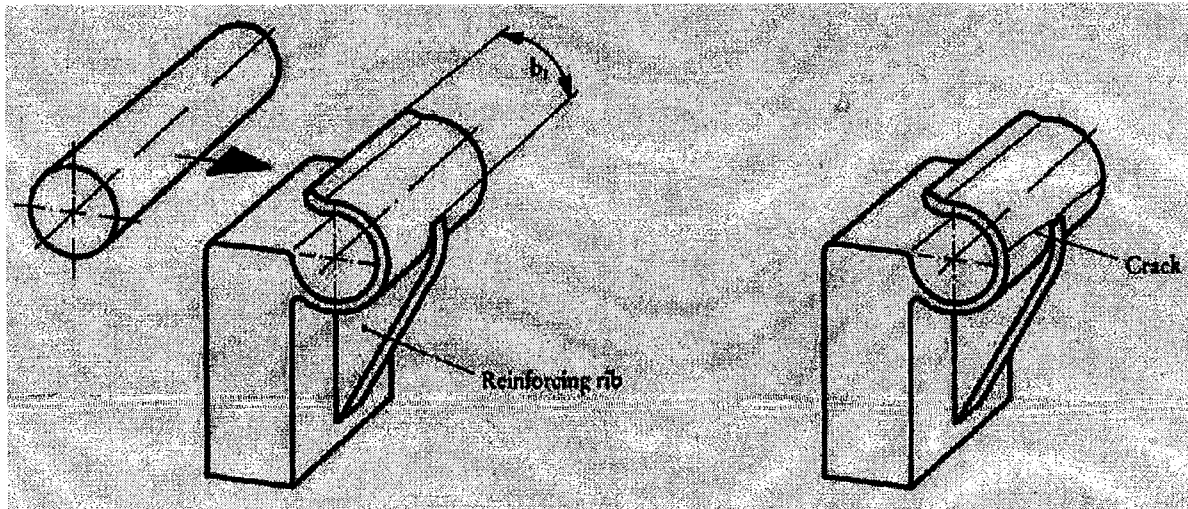
(20 marks)

- [d] Beryllium copper alloy is widely used as mould material especially in plastics blow moulding. Outline the advantages of this mould material as compared to other mould materials.

(20 marks)

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(iii)



Shapes required

(20 marks)

5. [a] Design of annular cross section extrusion dies always produce product with flow marks or weld lines on the surface of the end product. Give steps that can be introduced in terms of die design, to reduce the occurrence of flow marks or weld lines.

(40 marks)

- [b] What is important factors that can affect the quality of an extruded profile? List down rules (in terms of profile shape) that should be followed in designing a die for profile extrusion.

(40 marks)

- [c] With the assistance of suitable diagrams, list down **four** types of slit extrusion dies.

(20 marks)

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7. [a] What is the importance design software such as SolidWorks in producing a design for extrusion dies?  
(35 marks)
- [b] Give and describe formula that can be used to measure ejection force to eject product out of the mould.  
(35 marks)
- [c] Write short notes on gate and runners in moulding term.  
(30 marks)

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