

ADELAIDE UNIVERSITY**Department of Mechanical Engineering**

June 2001

6231:MANUFACTURING ENGINEERING 1 (PROCESSES)Time allowed: **TWO HOURS AND 10 MINUTES**

Students are advised to devote 10 minutes to reading the examination paper and planning their approach

NOTE CAREFULLY THE FOLLOWING:

1. Attempt **ALL** questions.
2. The **TOTAL** number of marks for the examination is **100**.
3. Questions are **NOT** of equal value, but the marks for each section are indicated on the paper.
4. Candidates are allowed to refer to notes and books, and to use any type of electronic calculator.

Question 1 begins on page 2

Question 1 (21 marks)

- (a) Sketch and clearly label a typical forming limit diagram for a low carbon steel. (8 marks)
- (b) Discuss the use of forming limit diagrams during “try out” of press tools. (5 marks)
- (c) During deep drawing what is the significance of a material's:
- (i) n value?
 - (ii) R value?
- (8 marks)

Question 2 (21 marks)

- a) Explain why forging may be considered either a primary or a secondary deformation process. (5 marks)
- b) Why is forging preferable to casting for some products? Illustrate your answer with an appropriate example. (4 marks)
- c) Why is forging preferable to machining for some products? Illustrate your answer with an appropriate example. (2 marks)
- d) High strength bolts are usually manufactured by upsetting to form the head and rolling to form the thread.
- i) What are the three rules governing upsetting? (6 marks)
 - ii) Why is the thread rolled rather than cut? (2 marks)
 - iii) How can visual inspection of a bolt often indicate that the thread has been rolled rather than cut? (2 marks)

Question 3 (10 marks)

An inventor has asked the Matilda Manufacturing Co. (Aust.) Ltd. to prepare a quotation for the production of an exciting new gardening tool. What factors would the company need to consider in determining the most suitable production process?
(10 marks)

Question 4 (31 marks)

- (a) Suggest five reasons for choosing casting as a preferred production method.
(5 marks)
- (b) Select and briefly describe five casting processes illustrating each with an appropriate example.
(20 marks)
- (c) How would you manufacture the following:
i) A hollow chocolate Easter egg.
ii) A solid chocolate rabbit.
(6 marks)

Question 5 (17 marks)

- (a) In terms of a material's melting point, what is the approximate temperature range for:
i) Hot working?
ii) Warm working?
iii) Cold working?
(3 marks)
- (b) What are the advantages and disadvantages of hot extrusion over cold extrusion?
(6 marks)
- (c) Describe four rolling defects and the cause of each type of defect.
(8 marks)

*****END OF EXAMINATION*****