**THE UNIVERSITY OF ADELAIDE**
**DEPARTMENT OF MECHANICAL ENGINEERING**

**EXAMINATION OF THE DEGREE OF B.E.**

**6231 MANUFACTURING ENGINEERING 1 (PROCESSES)**

**NOVEMBER 1999**

**TIME : TWO HOURS**

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[In addition, candidates are allowed 10 minutes before the examination begins, to read the paper.]

[The use of notes, textbooks and calculating devices is permitted in the examination room.]

[Appropriate engineering assumptions may be made for inadequate data.]

**Answer ONLY 4 (four) questions.**

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Question 1.

**Answer only 4 (four) of the following.**

a). What are the major costs involved in manufacturing?

[6 marks]

b). What are the major advantages of casting compared with other methods of basic shape production?

[6 marks]

c). Describe some common casting defects and suggest steps that may be taken to minimise the risk of such faults occurring.

[6 marks]

d). Define hot and cold working as applied to the manufacture of engineering products.

[6 marks]

e). Large reductions in cold rolling often require intermediate annealing heat treatments. Why?

[6 marks]

Question 2.

**Answer only 4 (four) of the following.**

a). What are the advantages of non-traditional machining processes compared with conventional metal cutting?

[6 marks]

b). What are the major differences between GMAW and GTAW?

[6 marks]

c). Describe the metal transfer modes which can operate in GMAW.

[6 marks]

d). Describe a suitable method of manufacture for metallic oil filter elements.

[6 marks]

e). Why are most plastic components made from thermoplastics rather than thermosets, even though the latter produce much stronger parts and are much more resistant to extremes of temperature?

[6 marks]

Question 3.

**Answer only 4 (four) of the following.**

What material and manufacturing method would you recommend for the following engineering products, and why?

a). The base of a lathe. [6 marks]

b). A saucepan. [6 marks]

c). Window frames. [6 marks]

d). Cutting tools. [6 marks]

e). A steel washer. [6 marks]

Question 4.

**Answer only 4 (four) of the following.**

What **joining** methods would you recommend for the following engineering applications, and why?

Briefly describe each process selected.

a). Plastic water pipes. [6 marks]

b). Steel pipes for carrying natural gas. [6 marks]

c). Sheet metal panels to a car doorframe. [6 marks]

d). Stainless steel wine fermentation vats. [6 marks]

e). A cylinder head to the engine block of a car. [6 marks]

Question 5.

**Answer only 4 (four) of the following.**

a). Explain why studying the types of chips produced is important in understanding machining operations.
[6 marks]

b). In metal cutting, define the rake angle and clearance angle. Why are these angles required?
[6 marks]

c). What are the essential properties of a cutting tool material?
What is meant by the term "hot hardness"?
[6 marks]

d). Discuss the flow of metal in an extrusion process, and describe the effects of lubrication.
[6 marks]

e). Although indirect extrusion almost eliminates friction, it is not commonly used in industry. Why?
[6 marks]



END OF EXAMINATION PAPER.