



STUDENT NUMBER

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CENTRE NUMBER

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HIGHER SCHOOL CERTIFICATE EXAMINATION

2000

INDUSTRIAL TECHNOLOGY

2 UNIT

SECTION II

METALS AND ENGINEERING INDUSTRIES

*Total time allowed for Sections I and II—One hour and a half
(Plus 5 minutes reading time)*

DIRECTIONS TO CANDIDATES

- Write your Student Number and Centre Number at the top right-hand corner of this page.
- Where appropriate, show all working for solutions neatly and clearly.
- You may use Board-approved drawing instruments and calculators.

Section II—Metals and Engineering (15 marks)

- Question 4 is COMPULSORY.
- Attempt TWO questions from Questions 5, 6, and 7.
- Answer the questions in the spaces provided in this paper.

MARKER'S USE ONLY

Question				
4				
5				
6				
7				

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SECTION II—METALS AND ENGINEERING

(15 Marks)

QUESTION 4 This question is **COMPULSORY**. (5 marks)

Figure 1 shows a fishing reel and a detailed view of a crank and handle that will be used for the fishing reel.

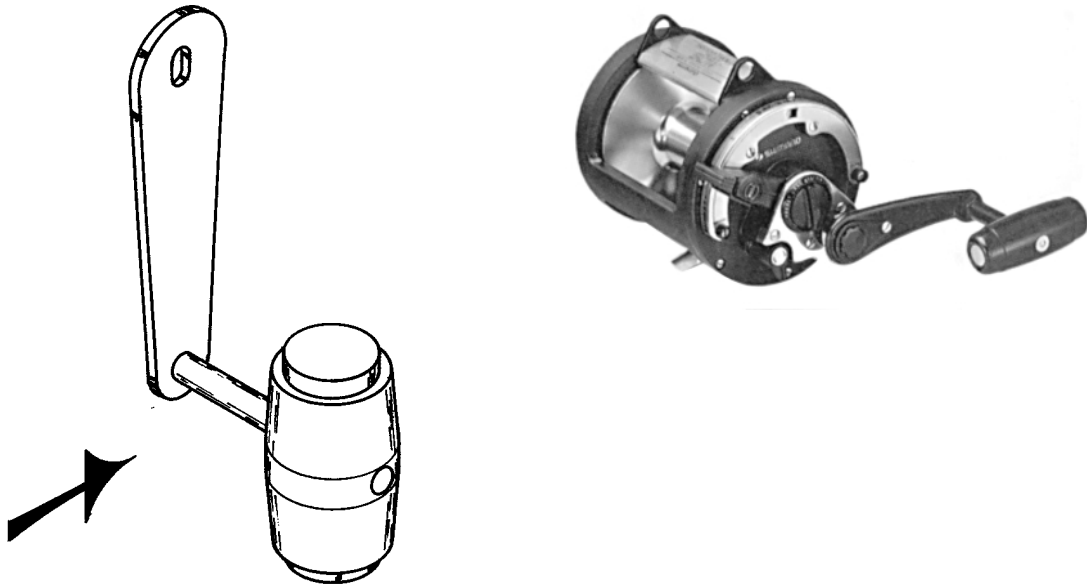
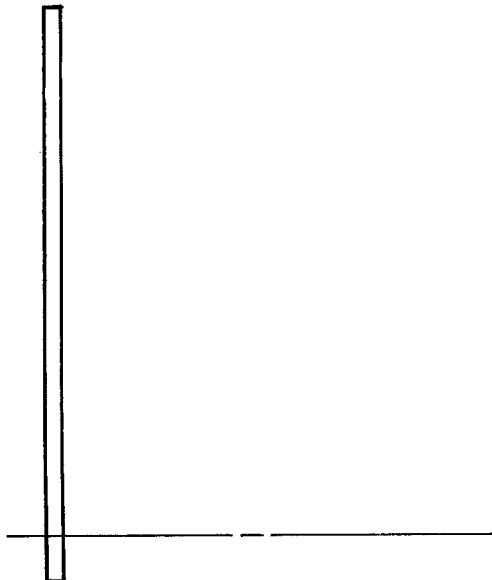


FIG. 1

- (a) Accurately sketch, in proportion, the view of the assembled crank and handle, in the direction of the arrow.

**Question 4 continues on page 4**

QUESTION 4 (Continued)

(b) Figure 2 shows the shape of the slot at one end of the crank.

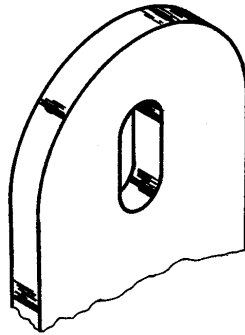


FIG. 2

Explain the purpose of this design feature.

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(c) (i) Explain the term *working drawings*.

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(ii) What is the purpose of detail drawings in metals and engineering industries?

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(d) Explain the term *tolerance* when applied to metals engineering.

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QUESTION 4 (Continued)

- (e) State the engineering terms for the abbreviations listed.

<i>Abbreviation</i>	<i>Engineering term</i>
ASSY	
CSK HD	
CYL	
SPEC	
CHAM	

- (f) Figure 3 shows an internal threaded hole.

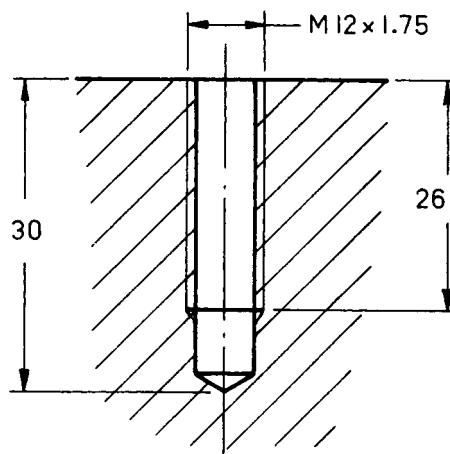


FIG. 3

- (i) Explain what is meant by 'M 12 × 1.75'.

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- (ii) State the length of the thread.

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Attempt TWO questions from Questions 5, 6, and 7.

QUESTION 5 (5 marks)

(a) The fishing reel crank and handle shown in Figure 4 is to be mass produced.

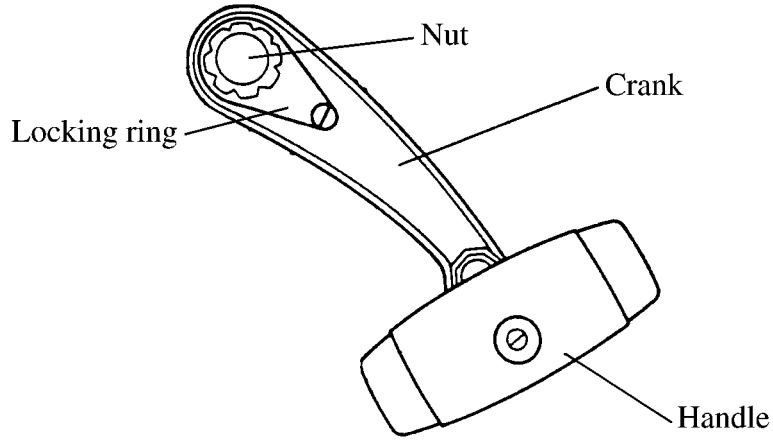


FIG. 4

(i) Name a suitable material for manufacturing the crank. Give TWO reasons for your choice.

Material

1 Reason for choice

.....

2 Reason for choice

.....

(ii) Name and describe a suitable method for manufacturing the crank.

Method

Description

.....

.....

.....

(iii) Identify an appropriate surface finish for the material named in part (i), and describe how it would be produced.

Surface finish

Description

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QUESTION 5 (Continued)

- (b) Describe how technological advances in materials and equipment have improved production processes in the metals engineering industry. Give specific examples of technological advances in relation to the manufacture of the crank.

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- (c) Figure 5 shows a handle locking ring and handle locking screw.

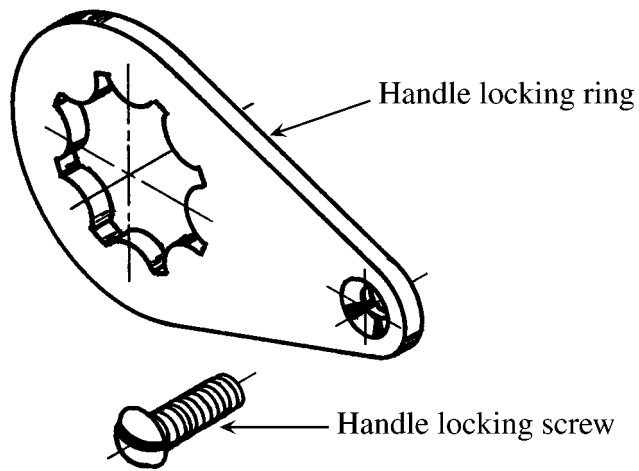


FIG. 5

Explain the purpose of the locking ring and screw.

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QUESTION 5 (Continued)

- (d) The spool of the fishing reel shown in Figure 1 is machined from a solid piece of alloy on an automated lathe.

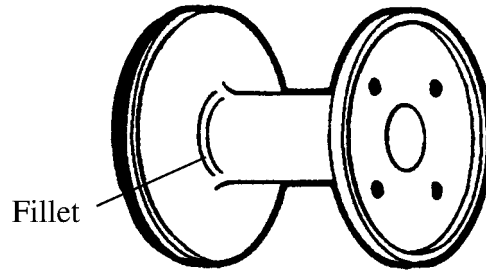


FIG. 6

Explain why a fillet is used in the design of the spool.

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Attempt TWO questions from Questions 5, 6, and 7.

QUESTION 6 (5 marks)

Figure 7 shows the frame of the fishing reel pictured in Figure 1. Engineers are considering whether to manufacture the frame in one piece.

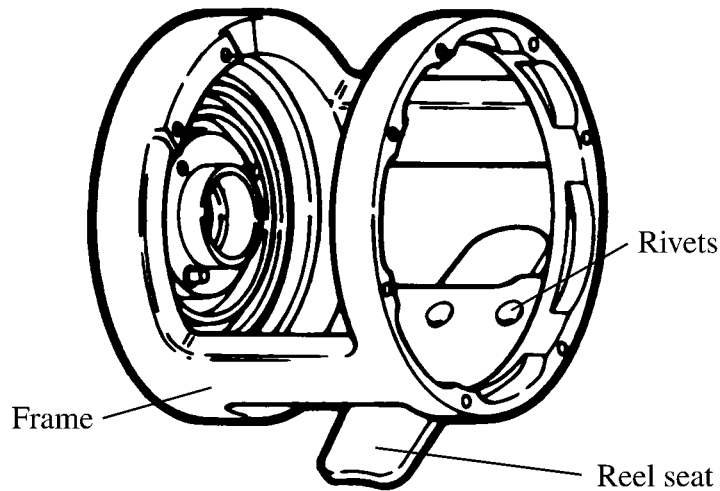


FIG. 7

(a) Explain TWO advantages of manufacturing the frame in one piece.

Advantage 1

Advantage 2

(b) (i) Name and describe a suitable method for manufacturing the frame in one piece.

Method

Description

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(ii) Suggest a suitable material for the frame, and give reasons for your choice.

Material

Reasons for choice

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QUESTION 6 (Continued)

(c) The frame requires threaded holes for the assembly of components.

Outline the steps involved in producing a hand-cut thread in a blind hole.

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(d) Name the following techniques, and describe their application in the manufacture of the frame.

Technique

Application

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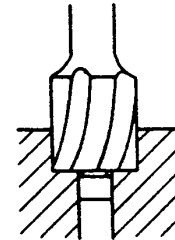


FIG. 8

Technique

Application

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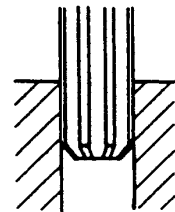


FIG. 9

Technique

Application

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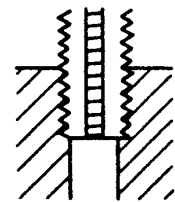


FIG. 10

QUESTION 6 (Continued)

(e) (i) Produce a sketch of a pop rivet and a solid rivet.

(ii) Describe ONE benefit of using rivets over machine screws in the fishing reel.

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(f) (i) What is meant by the term *anodising*?

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(ii) Explain the anodising process.

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Attempt TWO questions from Questions 5, 6, and 7.

QUESTION 7 (5 marks)

Figure 11 shows the main gear of the fishing reel pictured in Figure 1.

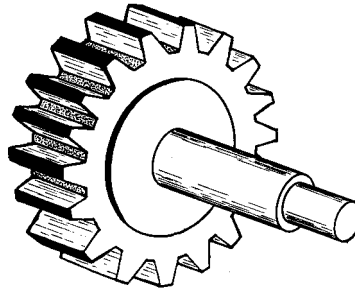


FIG. 11

(a) The main gear is to be manufactured from a single piece of stainless steel.

(i) What are the benefits of using stainless steel in this application?

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(ii) A quadrant of the main gear is shown in Figure 12. Complete the drawing to represent an appropriate shape for the teeth.

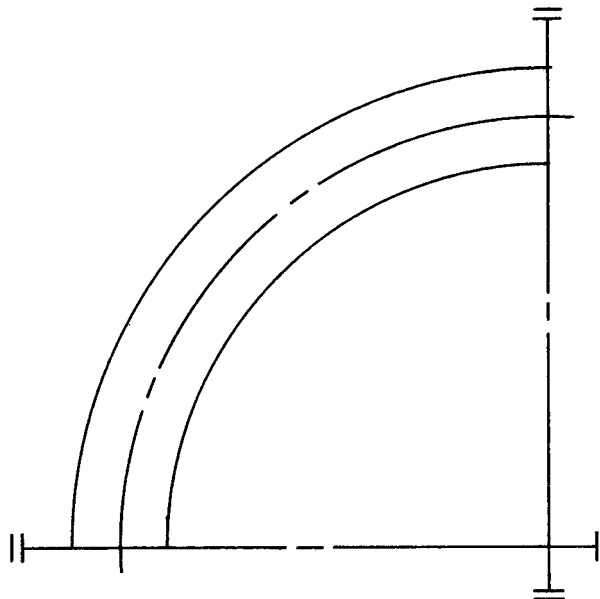


FIG. 12

QUESTION 7 (Continued)

(iii) Name and describe a process that would be used for cutting this gear.

Process

Description

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(iv) Explain why gears are used in fishing reels.

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(v) Name the gear shown in Figure 13, and state its application in the engineering field.

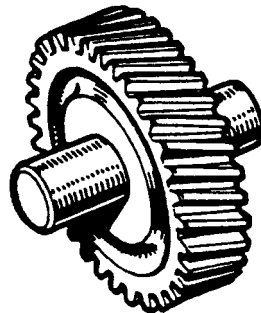


FIG. 13

Gear name

Application

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Question 7 continues on page 14

QUESTION 7 (Continued)

(b) The CAD/CAM system is used extensively in the engineering industry.

(i) Explain the relationship between CAD and CAM.

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(ii) Describe the benefits of using a CAD/CAM system in the engineering industry.

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(iii) Explain the term *numeric control* used in the field of engineering.

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