FORM TP 2018079

TEST CODE 01373020

MAY/JUNE 2018

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN SECONDARY EDUCATION CERTIFICATE® EXAMINATION

INDUSTRIAL TECHNOLOGY

OPTION B – MECHANICAL ENGINEERING TECHNOLOGY

Paper 02 – Technical Proficiency

2 hours 10 minutes

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. This paper consists of FIVE compulsory questions.
2. Use sketches where necessary to support your answers.
3. Write your answers in the spaces provided in this booklet.
4. Do NOT write in the margins.
5. You may use a silent, non-programmable calculator to answer questions.
6. This paper contains metric dimensions only. You should work your answers in the metric system.
7. You are advised to take some time to read through the paper and plan your answers.
8. If you need to rewrite any answer and there is not enough space to do so on the original page, you must use the extra lined page(s) provided at the back of this booklet. **Remember to draw a line through your original answer.**
9. **If you use the extra page(s) you MUST write the question number clearly in the box provided at the top of the extra page(s) and, where relevant, include the question part beside the answer.**

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

1. Figure 1 shows a typical lever opener which is used to open bottles which are fitted with corks. In an effort to start your own business you have decided that this opener can be manufactured in the workshop.

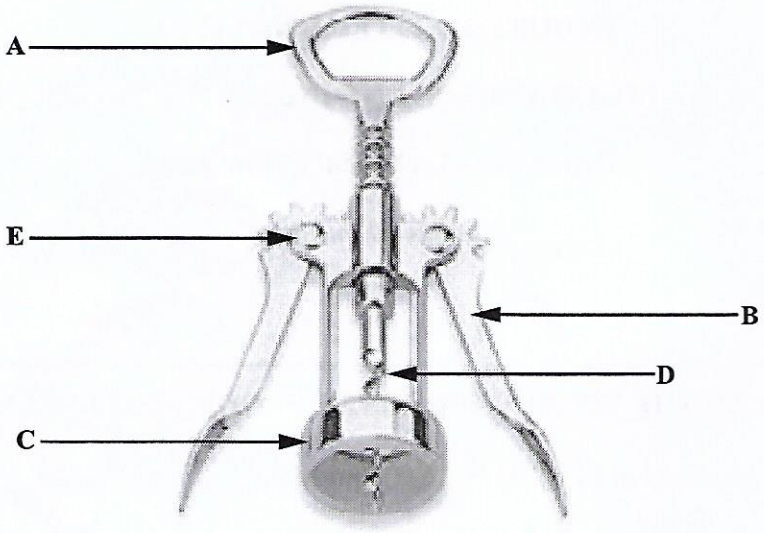

Figure 1. Lever opener

The parts list for the lever opener is as follows:

Part A – The stem, made from 10 mm diameter mild steel rod
Part B – The levers, made from 2 mm mild steel plate
Part C – The body, made from 2 mm mild steel plate
Part D – The auger, made from 2 mm diameter stainless steel wire
Part E – The pivot, which can be made from a material of your choosing

Using appropriate sketches where necessary, you are required to complete the following.

(a) Describe the steps of procedure for producing Part A.

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(6 marks)

(b) State why Part D is to be made of stainless steel.

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(c) Explain how Part A could be joined to Part D.

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(2 marks)

(d) Where would you use plastic in making this opener? Justify your answer.

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(e) Design a mechanism for Part E that would allow Part B to be disassembled from the body of the opener.

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(4 marks)

Total 18 marks

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2. Figure 2 shows a counterbored hole in an axle which is to be made on a drill press. The axle is made from aluminium, 50 mm in diameter and 250 mm long. **Note: The threads are to be produced by hand.**

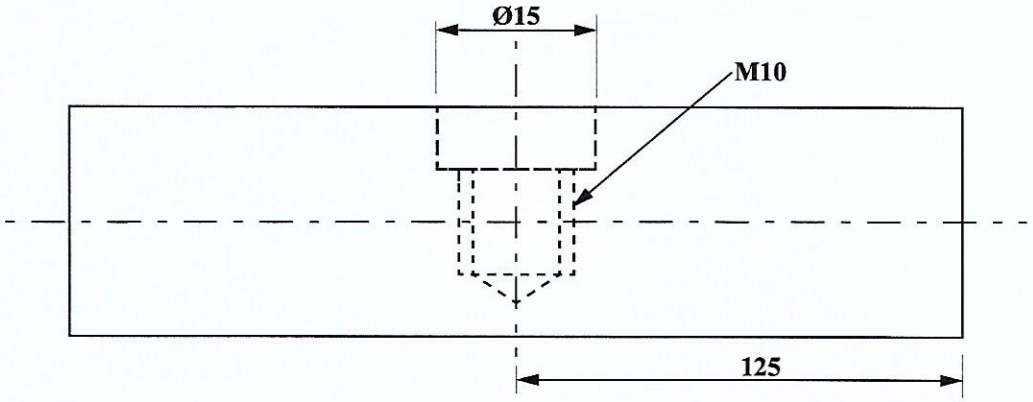

Figure 2. Axle

(a) Outline the steps of procedure for producing the counterbored hole and threads in the axle.

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(b) List FOUR tools which can be used in combination to produce the counterbored hole and threads in the axle.

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(c) Describe how the axle should be marked out in order to produce the hole perpendicular to the surface.

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(d) If the threaded hole is to be 25 mm in diameter, state TWO modifications to be made to the procedure described in (c).

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(e) List TWO properties of aluminium.

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Total 18 marks

3. Figure 3 shows a bushing which is to be made on a centre lathe from material 60 mm in diameter and 70 mm long.

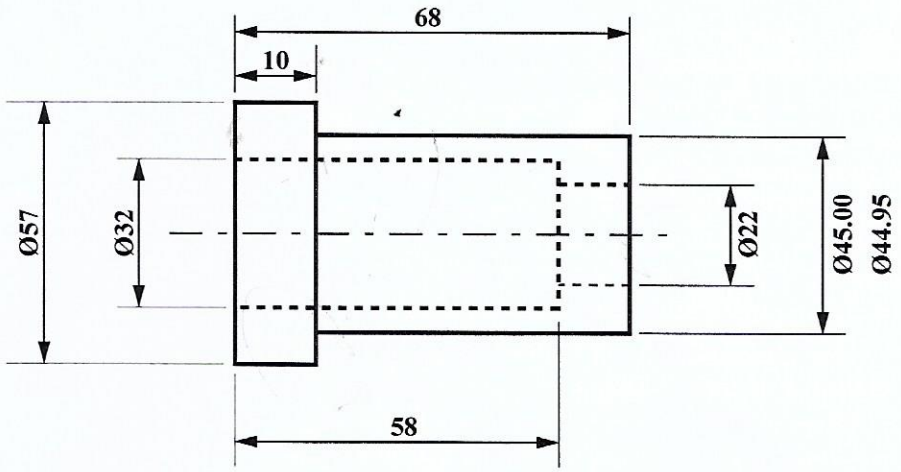

Figure 3. Bushing

(a) (i) Based on the geometry of the bushing, how many settings would be required to completely produce the bushing on the lathe?

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(1 mark)

(ii) State ONE safety precaution that should be observed when turning the bushing on the lathe.

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(b) Outline the steps of procedure for the final setting in the production of the bushing.

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(c) List FOUR lathe tools which can be used to produce the bushing.

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(4 marks)

(d) If a 1:20 taper over the length of the Ø45 mm part of the bushing is required, calculate the offset of the tail-stock.

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(6 marks)

Total 18 marks

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4. Figure 4 shows the plan view of a clutch bracket, which is to be produced by hand. The clutch bracket is to be made from 6 mm steel plate which is 180 mm long and 120 mm wide.

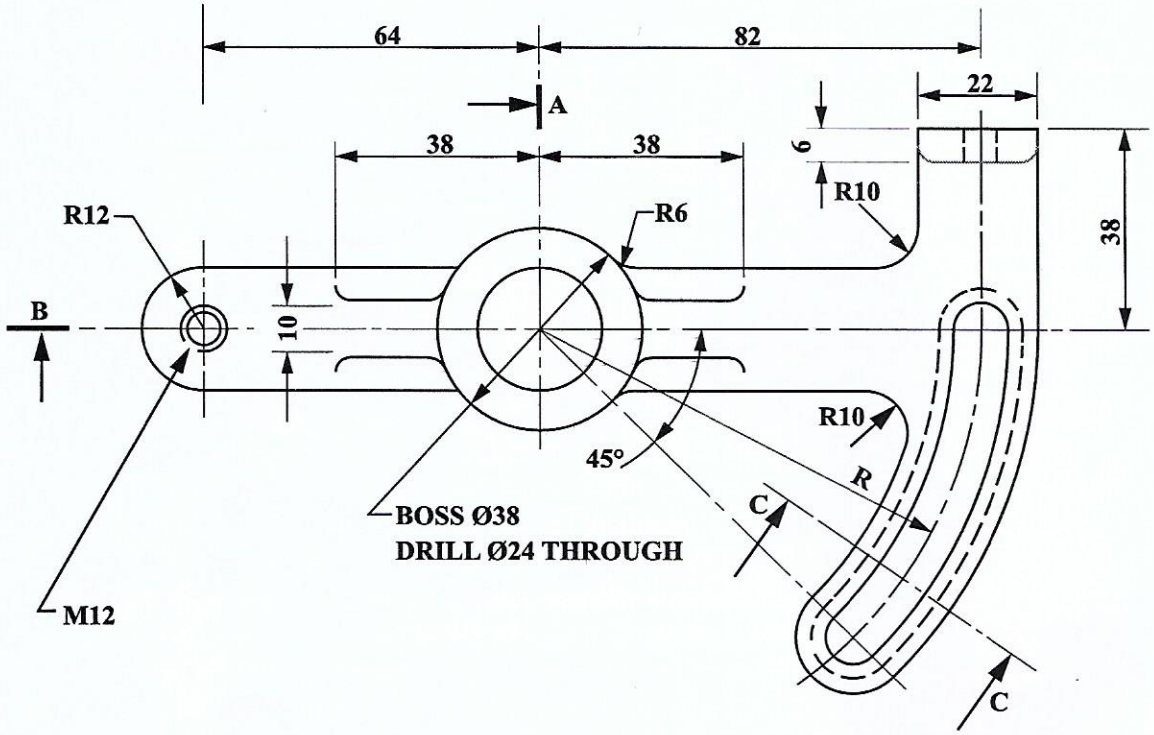

Figure 4. Clutch bracket

(a) Outline the steps of procedure for marking out the clutch bracket.

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(6 marks)

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(b) Name FOUR tools which can be used to completely mark out the clutch bracket.

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(4 marks)

(c) Name FOUR tools which can be combined to produce slot C–C.

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(d) Suggest FOUR safety precautions which should be followed when producing slot C–C.

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(4 marks)

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(e) Suggest TWO reasons for polishing the clutch bracket after it is made.

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(2 marks)

Total 18 marks

5. Figure 5 shows a watering can made from 16 gauge tinplate. The can's primary use is to conveniently water plants in a home garden.

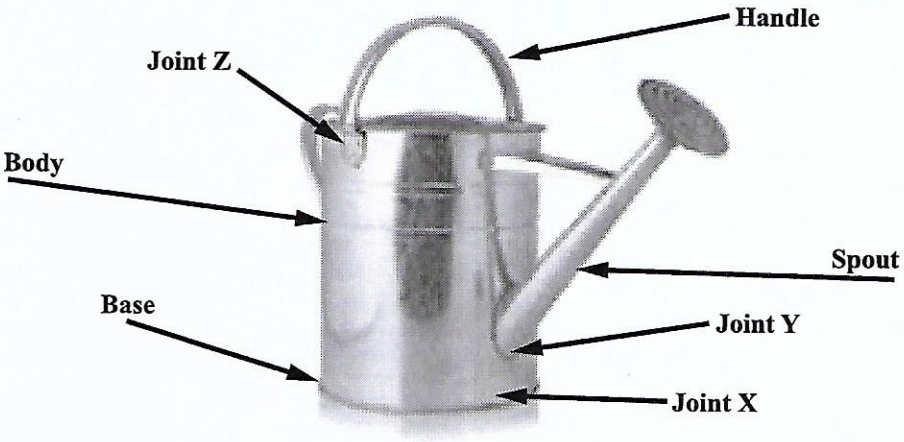

Figure 5. Watering can

(a) Name THREE methods that can be used to make the joints at X, Y and Z.

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(3 marks)

(b) Explain, with the aid of sketches, how you would ensure that the handle does not injure users of the watering can.

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(c) Outline the steps of procedure for joining the base to the body of the watering can.

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(6 marks)

(d) Name THREE tools which are used in joining the base and body of the watering can.

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(3 marks)

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(e) Sketch THREE types of rivets which can be used to attach the handle to the body of the watering can.

(3 marks)

Total 18 marks

END OF TEST

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.