07150554B

MECHANICAL PRODUCTION TECHNOLOGY LEVEL 5

ENG/OS/ME/CR/03/5

Produce Components on a Lathe

November/December 2025

TVET CURRICULUM DEVELOPMENT, ASSESSMENT AND CERTIFICATION COUNCIL (TVET CDACC)

WRITTEN ASSESSMENT

Time: 3 Hours

INSTRUCTIONS TO CANDIDATE:

1. This paper consists of **TWO** sections: **A** and **B**.
2. Answer **ALL** questions in section A and **ANY THREE** questions in section B.
3. Marks for each question are indicated in the brackets.
4. Candidates are provided with a separate answer booklet
5. Do not write on the question p

This paper consists of FOUR (4) printed pages

Candidate should check the question paper to ascertain that all pages are printed as indicated and that no questions are missing.

SECTION A: (40 MARKS)

Answer ALL the questions in this section.

1. A lathe machine carriage comprises of several parts. List TWO of these parts. (3 Marks)
2. The chuck guard is an essential part of a lathe machine. Outline TWO main purposes of this part. (2 marks)
3. Selection of cutting speed depends on several factors that determine the quality of the finished product. Highlight FOUR factors to consider. (4 marks)
4. Lathe machine cutting tool is made of different materials depending on the area of use and durability. Outline TWO materials used to make these tools. (2 Marks)
5. When performing lathe machine operations, cutting fluid is applied as cutting progresses. Give FOUR reasons of its application. (4 Marks)
6. Tool post is an accessory on a lathe that is used to hold and secure the cutting tool. List TWO types of this lathe accessory (2 Marks)
7. When with lathe machines, there are rules and regulations that a machinist should follow to have safe working environment. Enumerate FOUR dos which machinist should adhere to (4 marks)
8. After completing a task on a lathe machine, you are required to perform housekeeping activities. State FOUR activities you should perform (4 marks)
9. Chips are the pieces of material that are sheared off from the work piece surface by the cutting hining operation. Outline TWO types of this materials that are likely to form when Machining (2Marks)
10. Rake angle is a critical element of a cutting tool's geometry that determines the shearing action on the material. State ONE effect of increasing this angle during machining (2 Marks)
11. Chamfering is a finishing process performed on a lathe machine. Highlight TWO reasons for performing this process. (4 marks)
12. The relationship between a hole and a shaft is determined by how they fit during assembly. List THREE types of fits applicable. (3 Marks)
13. Highlight FOUR causes of vibration in a lathe machine. (4 Marks)

SECTION B :*(60* MARKS)

Answer Any THREE Questions in This Section

14.

a. A lathe machine has accessories that aid in performing specific functions. Discuss ONE function of the following accessories; (8 marks)

   i. Live centre;

   ii. d centre;

   iii. Follower rest;

   iv. Stationary steady.

b. Taper turning is a lathe operation commonly used in producing machine components such as spindles, shafts, and tool shanks where accurate fits are required.

   i. Explain this machining process (2 marks)

   ii. Describe THREE methods of achieving this machining process.(6 marks)

c. A work piece with a large diameter of 40 mm and a small diameter of 30 mm turned over a length of 100 mm. Calculate the taper angle (α) used.

(4 marks)

15.

a. Distinguish between Straight turning and steth reference t oturning operation. (4 Marks)

b. Explain the following lathe machine operations; (10 Marks)

   ii. Drilling;

   iii. Parting Off;

   iv. Knurling;

   v. Thread Cutt;

c. After machining on a lathe, it is important to ensure that the finished work piece meets the required specifications by performing quality control checks**.** Discuss THREE control checks that can be done (6 Marks)

16.

a. Concentric and eccentric chucks are important work-holding devices on a lathe machine. Explain TWO differences between these two chucks **(**4 Marks)

b. Proper mounting on the chuck improves both safety and efficiency during lathe operations. Explain FOUR safety precautions to observe when carrying out this process. (8 Marks)

c. Operation plan is a formal document used in manufacturing process. Outline FOUR importance of having this document. (8 Marks)

17.

a. A 20g bar is to be reduced in diameter from 50 mm to 45 mm in a single pass. The feed rate is 0.3 mm/rev and spindle speed is 400 rpm.

i. Calculate the machining time. (4 marks)

ii. If the same bar requires 3 passes, each removing equal depth, calculate the new total machining time. (3 marks)

b. Machining parameters are essential in determining the quality of finished parts. Explain the meaning of the following terms as used in lathe operations:

i. Depth of cut

ii. Feed rate

Cutting speed

iv. Material Removal Rate (8 Marks)

c. A shaft is to be turned on a lathe to a nominal diameter of 50 mm with a tolerance of ±0.05

i. Calculate the maximum limit and minimum limit of the shaft diameter. (2 marks)

ii. Determine the allowance if the mating hole has a diameter of 50.10 mm (3 Marks)