071506T4MTP

MECHANICAL TECHNOLOGY LEVEL 6

ENG/OS/ME/CR/06/6

Produce Parts by Surface Grinding

July/August 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. Attempt **ALL** questions in section A and **ANY THREE (3)** questions in section B.
3. Marks for each question are indicated in the brackets.
4. Candidates are provided with answer booklet.
5. Do not write on the question paper.

This paper consists of FIVE 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)

Attempt ALL the questions in this section.

1. Grinding operations are carried out in mechanical workshops using various types of grinding machines. Name TWO types. (2 Marks)
2. When performing grinding, the shape of surface to be produced depend on the grinding wheel used. types of wheels. (3 Marks)

3. In modern industries, grinding has become a key operation in the manufacturing process. List THREE of its applications. (3 Marks)

4. Safety is a key aspect when grinding aluminum. State TWO precautions to be observed when grinding this metal. (2 Marks)
5. Before mounting a grinding wheel on a grinding machine, it is important to carry out balancing on the wheel. List two benefits of this practice. (2 Marks)
6. The following are construction features of a surface grinder machine. Give TWO functions of

   ii. Table (4 Marks)

7. You are working in a certain mechanical workshop that specializes in grinding operations. The manager asks you to carry out wheel truing and dressing of;

   i. wheel truing;
   ii. wheel dressing (4 Marks)

8. You are, a company that deals with the production of grinding wheels. You are recruiting one new technician, and you need to explain to him the concept of grinding wheel wear. Identify THREE mechanisms considered as principle causes of wear. (3 Marks)

9. You are working in a company that specializes in production and you are tasked with explaining the advantages of centerless grinding process to a new technician. List THREE advantages of this process. (3Marks)

10. Grinding wheels are essential tools designed to smoothen metal surfaces by utilizing artificial abrasive materials embedded in the wheels. List THREE types of these abrasive materials. (3 Marks)

11. Different operations are performed on a universal grinding machine. Sketches the following types of operations as associated with grinding.
    i. Traverse cylindrical grinding

ii. plunge types cylindrical grinding. (4 Marks)

12. All work pieces to be ground on a grinding machines must be well secured. Give THREE work holding device used. (3 Marks)

13. The following code was scribed on a grinding wheel according to American National Standards Institution (ANSI). Indicate the meaning of each symbol.

W A 36 K 5 V 17 (4 Marks)

SECTION B (60 MARKS)

Attempt any THREE questions in this section

14.

a. A technician is working at WXY Engineering works limited. He was tasked by his manager to carry-out grinding on five lathe cutting tools and three drill bits, as a production plan. He noticed that the grinding wheel was not mounted in the pedestal grinding machine. Give the procedure he used to balance and mount the grinding wheel. (8 Marks)

b. While using a grinding machine adhering to safety measures is essential to prevent accidents and injuries. State FOUR safety precautions (4 Marks)

c. You are the senior technician of a machining workshop. As part of your role, you need to educate your team about the qualities of a good cutting fluids. Discuss FOUR qualities that you will present to them. (8Marks)

15.

a. List FOUR one should consider when selecting a grinding wheel to carry out grinding operations successfully. (4 Marks)

b. Wheel dressing is an essential operation carried out on a grinding wheel to ensure uniform grinding, perfect surface finish and precision. Using a diagram, carrying this operation. (8 Marks)

c. A shaft of length 180mm is to be reduced from a diameter of 47mm to a diameter of 45mm in one pass using a grinding wheel of 20mm face width. Assume a cutting speed of 185mm/min and depth of cut of 0.25mm, calculate the time required. (8 Marks)

16.

a. Discus THREE basic parameters of a grinding wheel. (6 Marks)

b. Detection of faults and their prolong the grinding wheel life. Discuss THREE faults and the ir solutions. (6 marks)

c. A steel work piece of 100 mm width and 250 mm length is being ground on a horizontal grinder having a grinding wheel of diameter as 250 mm and width as 20 mm. The table speed on which the work piece is mounted is 10 mm/min and the grinding wheel speed is 1528 rpm. Find out the time required to finish the work piece. Take the in-feed rate as 4 mm per pass. (8 Marks)

17. 'In-feed' and 'end-feed' are methods used in grinding operations. With the aid of neat sketches differentiates between the two. (8 Marks)

a. The proper selection operating conditions is very important for the success of any grinding. Discuss the following conditions and their effects on grinding

i. Wheel Speed (Peripheral Speed)

ii. Workpiece Speed

iii. Depth of Cut (DOC)

iv. Feed Rate (8 Marks)

b. When small amounts of materials are to be removed surface finish in microns, it's difficult to attain this on a normal surface grinder. Explain TWO methods one can use to attain super finished products. (4 Marks)