

higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

(11021871)

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T680(E)J291T

DEPARTMENT OF HIGHER EDUCATION AND TRAINING REPUBLIC OF SOUTH AFRICA NATIONAL CERTIFICATE FITTING AND MACHINING THEORY N1

TIME: 3 HOURS
MARKS: 100

INSTRUCTIONS AND INFORMATION

1. Answer ALL the questions.
2. Read ALL the questions carefully.
3. Number the answers according to the numbering system used in this question paper.
4. Write neatly and legibly.

(11021871)

FITTING AND MACHINING THEORY N1

T680(E)J291T
AUGUST EXAMINATION
NATIONAL CERTIFICATE

29 July 2013 (X-Paper)
09:00–12:00

This question paper consists of 10 pages.

QUESTION 1

1.1 Colour codes are a safety measure which we use to identify certain safety features in every workshop. Identify the colour code of the pipeline that will feature in the following contents:

- 1.1.1 Water (5 × 1)
- 1.1.2 Steam (5)
- 1.1.3 Oil
- 1.1.4 Air
- 1.1.5 Alkalis

1.2 Marking off may be defined as the scribing of lines on the surface of a work piece using various marking-off tools. Explain the function of the following marking-off tools.

- 1.2.1 V-blocks (5 × 1)
- 1.2.2 Engineers square (5)
- 1.2.3 Angle plate
- 1.2.4 Jenny callipers
- 1.2.5 Surface gauge

1.3 Indicate whether the following statements are TRUE or FALSE. Choose the answer and write only 'true' or 'false' next to the question number (1.3.1-1.3.6) in the ANSWER BOOK.

- 1.3.1 Ball-peen hammers are used to hammer delicate workpieces. (6)
- 1.3.2 The length of a file is measured from its end to its shoulder and does not measure or include the tang. (16)
- 1.3.3 A cross-cut chisel is used to cut or shave material off sheet metal when it is in a vice. (6)
- 1.3.4 A centre punch is used to mark off holes which must be drilled and the point is ground to an angle of 60 degrees. (6)
- 1.3.5 Long-nose pliers are generally used for reaching into tight corners. (6)
- 1.3.6 Spanners should only be used for their specific purposes and leverage can be increased by using a pipe or other means. (6)

QUESTION 2

2.1 Measuring instruments should be used for their intended purpose only and should be treated with care. FIGURE 1 indicates the reading of an outside micrometer. Study the drawing carefully and then answer the questions that follow.

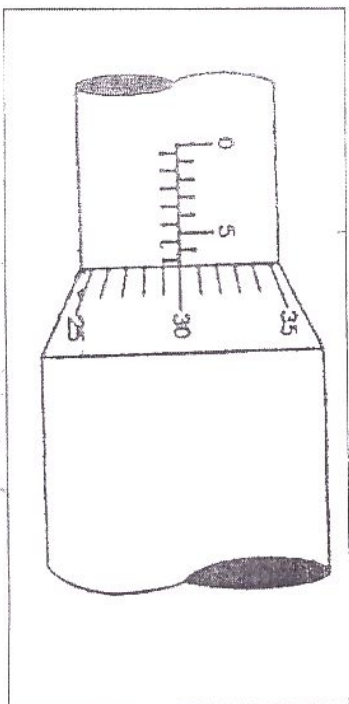


FIGURE 1

2.1.1 Indicate the reading of the outside micrometer as shown in FIGURE 1. (3)

2.1.2 State the degree of accuracy of this micrometer. (3)

2.1.3 Indicate ONE practical use of the outside micrometer. (3)

2.2 FIGURE 2 indicates the reading on a depth micrometer. Carefully study the drawing and answer the questions that follow:

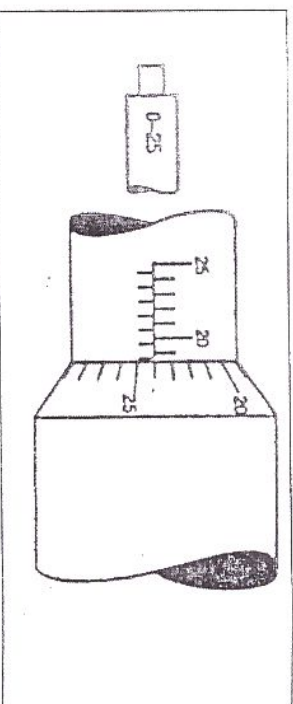


FIGURE 2

2.2.1 Indicate the reading of the depth micrometer in FIGURE 2.

2.2.2 State the degree of accuracy of the depth micrometer.

2.2.3 Indicate ONE use of the depth micrometer. (3 x 1) (3)

2.3 FIGURE 3 indicates the reading of a vernier calipers. Carefully study the drawing and answer the questions that follow:

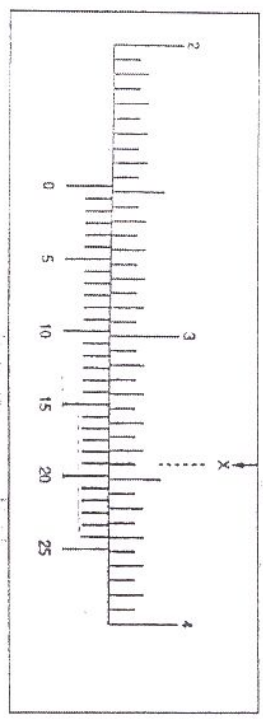


FIGURE 3

2.3.1 Indicate the reading of the vernier calipers in FIGURE 3.

2.3.2 State the degree of accuracy of the vernier calipers.

2.3.3 Indicate ONE use of the vernier calipers in industry. (3 x 1) (3)

2.4 FIGURE 4 indicates the reading of a vernier protractor. Study the drawing carefully and answer the questions that follow:

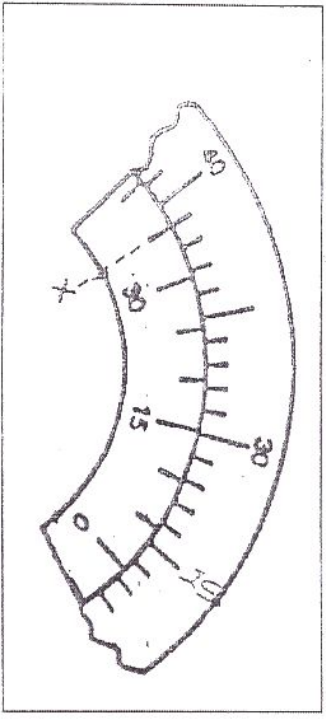


FIGURE 4

2.4.1 Indicate the reading of the vernier protractor in FIGURE 4.

2.4.2 State the degree of accuracy of the vernier protractor.

2.4.3 Indicate ONE practical use of the vernier protractor in industry. (3 x 1) (3)

2.5 Name the TWO main groups that metals are divided into which are commonly used in industry. (2)

2.6 Certain workshop tests can be performed on metals to distinguish them from each other.

Identify TWO such tests that can be used in industry. (2)

2.7 Heat treatment is a process by which the properties of plain carbon steel may be changed. Explain the purpose of each of the following heat treatment processes when performed on steel:

2.7.1 Hardening

2.7.2 Annealing

2.7.3 Normalising

2.7.4 Tempering

2.7.5 Case hardening

2.8 Nylon is a plastic which in many instances can be a substitute to steel. Identify TWO examples of objects used in industry which are made from nylon. (2) [23]

QUESTION 3

3.1 In practice various types of screw threads are used for a specific purpose. Indicate THREE types of screw threads that are used in industry. (3)

3.2 Calculate the depth of a M20 x 2.5 screw thread. M20 being the diameter and the 2.5 the pitch in millimeters. (3)

3.3 State FOUR different types of keys used in practice to prevent rotation between mating machine parts in industry. (4)

3.4 A shaft with a diameter of 36 mm must be provided with a key and keyway to secure a pulley to it. Calculate the height and the width of the key to serve its purpose. (2)

3.5 Indicate whether the following statements are TRUE or FALSE. Choose the answer and write only 'true' or 'false' next to the question number (3.5.1-3.5.4) in the ANSWER BOOK.

3.5.1 Allen screws are self-tapping screws.

3.5.2 We use drive screws to connect the drive between two machines.

3.5.3 The nylon nut is a positive locking nut.

3.5.4 Flat washers spread the tightening load from a nut over a larger area. (4 x 1) (4)

3.6 Taps are used to cut an internal thread in the holes of objects such as nuts. Identify TWO methods that are used to ensure a tap is at right angles to the workpiece before tapping is done. (2)

3.7 State THREE types of taps that make up a set that is used to cut an internal thread in industry. (3) [21]

QUESTION 4

4.1 Most metal-cutting operations use cutting fluids. (3)

4.2 Indicate THREE functions of cutting fluid when used on a drilling machine. (3)

4.2 The cutting speed for mild steel is 30 m/min and the diameter of the drill is 12 mm. Calculate the spindle speed in r/sec to drill the hole. (2)

4.3 Indicate whether the following statements are TRUE or FALSE. Choose the answer and write only 'true' or 'false' next to the question number (4.3.1-4.3.4) in the ANSWER BOOK. (4)

4.3.1 The process that makes provision for a 60 degree screw thread to be finished with the surface of a workpiece is known as counter boring.

4.3.2 The feed of the drill on a sensitive drilling machine is transferred by means of a plain lever on which a pinion is fitted and meshes with a rack.

4.3.3 To remove a straight shank drill from a drilling machine spindle we use a tapered drift.

4.3.4 Drills up to 50 mm in diameter may be used on a column drilling machine. (4 x 1) (4)

4.4 Write the letters (a-e) in the ANSWER BOOK and identify the correct cutting lathe component or accessory, where various cutting operations can be carried out. (4)

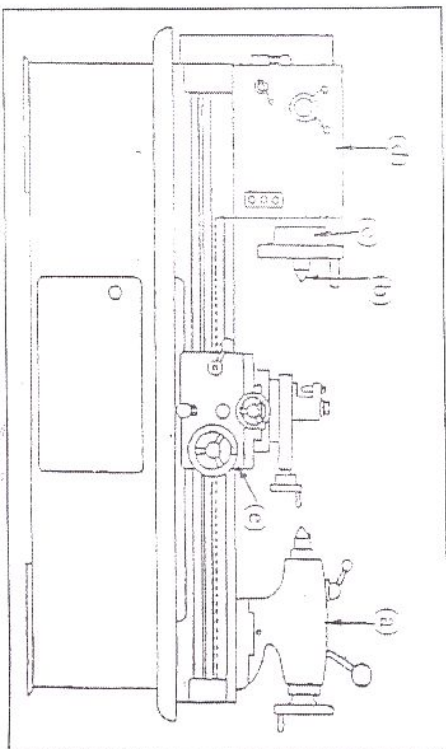


FIGURE 5

4.5 The cutting operations use a single-point cutting tool which may be fed in parallel to the workpiece which is held between centres. (3)

4.5 State TWO advantages of workpieces being held between centres on a lathe. (2)

4.6 For a cutting tool to be effective the material it is made of must possess certain properties and must have the correct cutting angle. (4)

4.6 Explain the difference between a positive rake and a negative rake. (4) [20]

QUESTION 5

5.1 Your workpiece must be properly clamped on the shaping machine in order to prevent damage to the machine or workpiece.

Identify TWO methods that you can use when clamping a workpiece on a shaping machine.

(2)

5.2 The ram is a rigid casting located at the top of the machine column and the ram head is carried on the front of the ram.

Indicate the THREE basic components that the ram head consists of.

(3)

5.3 The following information was given to an apprentice to machine a workpiece on a shaping machine:

- Width of the workpiece – 300 mm
- Cutting speed – 30 m/min
- Cutting stroke ratio – 4 : 1
- Table feed – 1.0 mm/stroke
- Stroke length – 800 mm

Calculate the time it will take for one cut across the width of the workpiece.

(3)

5.4 Write the letters (A-F) in FIGURE 6 in the ANSWER BOOK and identify the correct milling machine components.

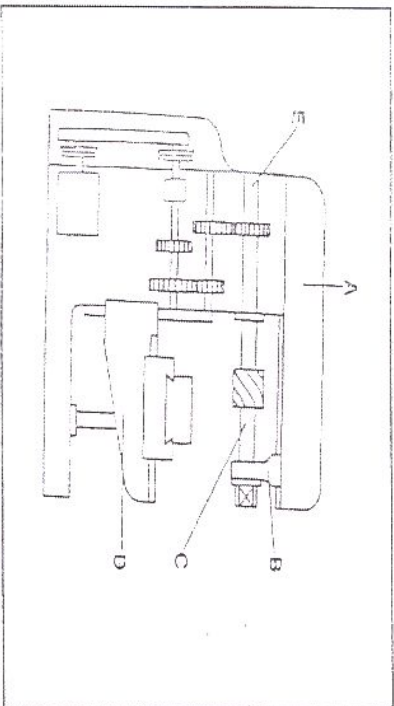


FIGURE 6

(5)

5.5 There are various types of milling machines used in industry. State THREE uses of the milling machine.

(3)

5.6 Indicate whether the following statements are TRUE or FALSE. Choose the answer and write only 'true' or 'false' next to the question number (5.6.1-5.6.4) in the ANSWER BOOK.

5.6.1 The spindle speed must exceed the maximum operating speed marked on the wheel.

5.6.2 Compressible washers provide better control of friction between the flange and the wheel.

5.6.3 Flanges must not be less than two-thirds the diameter of the wheel.

5.6.4 The thread must be in the same direction to the rotation of the spindle so that the nut will tend to tighten as the spindle goes round.

(4 × 1)

(4)

TOTAL: 100

[20]