higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

MACHINE MANUFACTURING
NQF LEVEL 3

(6030203)

7 March 2022 (X-paper)
09:00–12:00

This question paper consists of 8 pages.

211Q1S2207

**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. Start each question on a new page.

5. Only use a black or blue pen.

6. Write neatly and legibly.

QUESTION 1

1.1   Choose a term from COLUMN B that matches a description in COLUMN A. Write only the letter (A–E) next to the question number (1.1.1–1.1.4) in the ANSWER BOOK

COLUMN A		COLUMN B	
1.1.1	When a machine guard is not in place and you can get into contact with moving parts, it is classified as this	A	horse play
		B	injuries
		C	safety hazard
1.1.2	Too much noise is classified as this	D	interlocking guard
1.1.3	Not obeying the safety rules on machinery can result in this	E	health hazard
1.1.4	Playing the fool in a workshop		

(4 × 1)   (4)

1.2   Indicate whether the following statements are TRUE or FALSE by writing only 'True' or 'False' next to the question number (1.2.1–1.2.5) in the ANSWER BOOK.

1.2.1   A fixed guard is to protect persons and can easily be removed.

1.2.2   A trip guard is for keeping persons away from machinery.

1.2.3   An automatic guard can be activated by pressing the start button.

1.2.4   The machine will only operate when the interlocking guard is in the closed position.

1.2.5   A distance guard is to keep one away from dangerous machinery.

(5 × 1)   (5)

1.3   Housekeeping is very important.

Why would it be dangerous to pack tools on the headstock of a lathe while the machine is in motion?   (3)

1.4   Explain why illumination or lighting is there to improve machine safety.   (3)

[15]

QUESTION 2

Study the tables of fits and limits (below) and then answer the questions.

TOLERANCES FOR INSIDE DIMENSIONS (HOLES) (UNITS IN 0.001MM) — UNITS IN MM

OVER	TO	A11	B8	B11	C11	D9	D10	D11	E8	E9	F6	F7	F8	G6	G7	H5	H6	H7	H8	H9	H10
0	1	—	—	—	+120	+45	+60	+80	+28	+39	+12	+16	+20	+8	+12	+4	+6	+10	+14	+25	+40
1	3	+330 / +270	+154 / +140	+200 / +140	+60	+20	+20	+20	+14	+14	+6	+6	+6	+2	+2	0	0	0	0	0	0
3	6	+345 / +270	+158 / +140	+215 / +140	+145 / +70	+60 / +30	+78 / +30	+105 / 30	+38 / +20	+50 / +20	+18 / +10	+22 / +10	+28 / +10	+12 / +4	+16 / +4	+5 / 0	+8 / 0	+12 / 0	+18 / 0	+30 / 0	+48 / 0
6	10	+370 / +280	+172 / +150	+240 / +150	+170 / +80	+76 / +40	+98 / +40	+130 / +40	+47 / +25	+61 / +25	+22 / +13	+28 / +13	+35 / +13	+14 / +5	+20 / +5	+6 / 0	+9 / 0	+15 / 0	+22 / 0	+36 / 0	+58 / 0
10 / 14	14 / 18	+400 / +290	+177 / +150	+260 / +150	+205 / +95	+93 / +50	+120 / +50	+160 / +50	+59 / +32	+75 / +32	+27 / +16	+34 / +16	+43 / +16	+17 / +6	+24 / +6	+8 / 0	+11 / 0	+18 / 0	+27 / 0	+43 / 0	+70 / 0

TOLERANCES FOR OUTSIDE DIMENSIONS (SHAFTS) (UNITS IN 0.001MM) — UNITS IN MM

OVER	TO	a11	b8	b11	c11	d9	d10	d11	e7	e8	e9	f6	f7	f8	f9	g5	g6	g7	h4	h5	h6	h7
0	1	—	—	—	-60	-20	-20	-20	-14	-14	-14	-6	-6	-6	-6	-2	-2	-2	0	0	0	0
1	3	-270 / -330	-140 / -154	-140 / -200	-120	-45	-60	-80	-24	-28	-39	-12	-16	-20	-31	-6	-8	-12	-3	-4	-6	-10
3	6	-270 / -345	-140 / -158	-140 / -215	-70 / -145	-30 / -60	-30 / -78	-30 / -105	-20 / -32	-20 / -38	-20 / -50	-10 / -18	-10 / -22	-10 / -28	-10 / -40	-4 / -9	-4 / -12	-4 / -16	0 / -4	0 / -5	0 / -8	0 / -12
6	10	-280 / -370	-150 / -172	-150 / -240	-80 / -170	-40 / -76	-40 / -98	-40 / -130	-25 / -40	-25 / -47	-25 / -61	-13 / -22	-13 / -28	-13 / -35	-13 / -49	-5 / -11	-5 / -14	-5 / -20	0 / -4	0 / -6	0 / -9	0 / -15
10 / 14	14 / 18	-290 / -400	-150 / -177	-150 / -260	-95 / -205	-50 / -93	-50 / -120	-50 / -160	-32 / -50	-32 / -59	-32 / -75	-16 / -27	-16 / -34	-16 / -43	-16 / -59	-6 / -14	-6 / -17	-6 / -24	0 / -5	0 / -8	0 / -11	0 / -18

2.1 A size of 16H7g6 is given.

Determine the various limits and tolerances by using the tables above to answer the following questions:

2.1.1 What is the upper limit of the hole?

2.1.2 What is the lower limit of the shaft?

2.1.3 What is the tolerance on the hole?

2.1.4 What is the tolerance on the shaft?

(4 × 2) (8)

2.2 Machine symbols are used on drawings so that the artisan knows what machining must be done.

Draw the following machine symbols:

2.2.1 Spot facing

2.2.2 Chamfering

(2 × 2) (4)

2.3   Draw the following symbols that are used in surface texture symbols regarding the direction of the lay:

    2.3.1   Parallel lay

    2.3.2   Perpendicular lay

    2.3.3   Angular lay in both directions

                                               (3 × 1)   (3)
                                                  [15]

QUESTION 3

3.1   Various options are given as possible answers to the following questions. Choose the answer and write only the letter (A–D) next to the question number (3.1.1–3.1.4) in the ANSWER BOOK

    3.1.1   What do we call this type of tool in the sketch?

        A   Centre drill
        B   Jobber drill bit
        C   Taper shank drill
        D   Masonry drill bit

    3.1.2   What do we call this type of tool in the sketch?

        A   Masonry drill bit
        B   Jobber drill bit
        C   Taper shank drill
        D   Centre drill

    3.1.3   What do we call this type of tool in the sketch?

        A   Straight shank drill bit
        B   Jobber drill bit
        C   Taper shank drill
        D   Centre drill

3.1.4 What do we call this type of tool in the sketch?

A Straight shank drill bit
B Masonry drill bit
C Tap
D Morse taper

(4 × 1) (4)

3.2 What is the purpose of using parallels when using a milling machine? (3)

3.3 Draw a sketch to illustrate a shaft being clamped in a V-block. (4)

3.4 A drill with a 20 mm diameter is used to drill a hole in brass.

Calculate the cutting speed in mm/sec if the drilling machine is set at 190 r/min. (4)

[15]

QUESTION 4

4.1 Choose a term from COLUMN B that matches a description in COLUMN A. Write only the letter (A–E) next to the question number (4.1.1–4.1.4) in the ANSWER BOOK

COLUMN A		COLUMN B	
4.1.1	The process of cutting threads inside a hole	A	boring
4.1.2	An operation to enlarge holes on a lathe or milling machine	B	tapping
		C	reaming
4.1.3	Removing a small amount of metal from a hole already drilled	D	knurling
		E	drilling
4.1.4	Putting grip on a round work piece		

(4 × 1) (4)

4.2 A lathe has a *lead screw* and a *feed shaft*.

Explain the function of each. (4)

4.3 Show, by means of a sketch, a facing operation used on a lathe, and show the moving direction of the tool. (3)

4.4 For which FOUR purposes are a lathe used? (4)

4.5 Show, by means of a sketch, the difference between a *half centre* and a *dead centre.* (2 × 2) (4)

4.6 FIGURE 1 (below) shows a milling machine. Name the parts numbered (4.6.1–4.6.6) in the ANSWER BOOK.
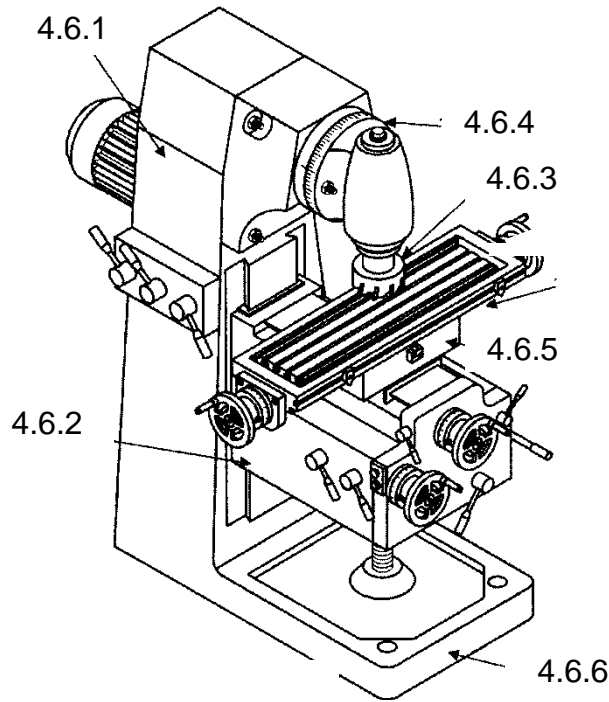

FIGURE 1

(6 × 1)   (6)

4.7 You are required to machine 21 grooves on a shaft by using a milling machine.

Use the Brown and Sharp dividing head to calculate the required indexing.

NOTE: The details of the Brown and Sharp dividing head are as follow:

Plate 1: 15, 16, 17, 18, 19 and 20 holes
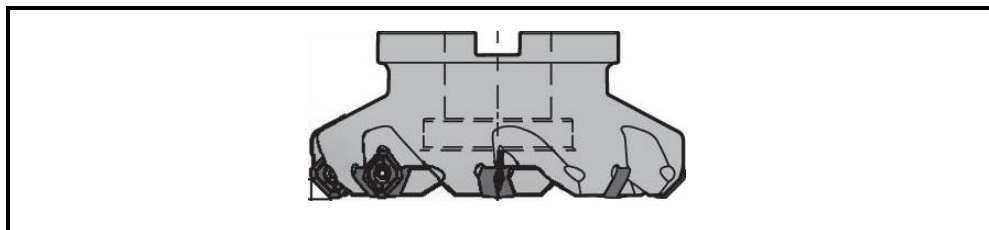Plate 2: 21, 23, 27, 29, 31 and 33 holes
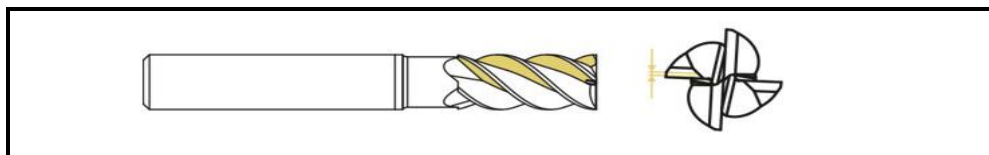Plate 3: 37, 39, 41, 43, 47 and 49 holes   (5)

4.8 The following are sketches of typical milling machine tools. State what each one is called and give a short description of the function of each. Write your answer next to the question number (4.8.1–4.8.3) in the ANSWER BOOK.
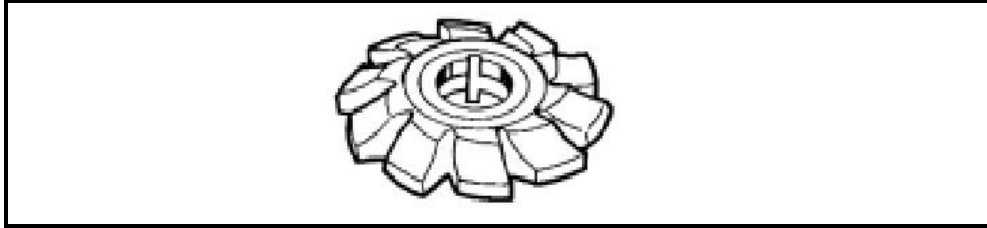
4.8.1

4.8.2

4.8.3

(3 × 2)   (6)

4.9   Indicate whether the following statements are TRUE or FALSE by writing only 'True' or 'False' next to the question number (4.9.1–4.9.4) in the ANSWER BOOK.

   4.9.1   When working on a milling machine, it is safer to stop the machine completely in order to take measurements.

   4.9.2   When a milling cutter is stopped on a milling machine, it will rotate for a while. It is then safe to stop the cutter with your hand.

   4.9.3   An artisan that does good housekeeping takes pride in his/her work.

   4.9.4   A CNC milling machine can be left unattended.

(4 × 1)   (4)
[40]

QUESTION 5

5.1   CAD drawings are used globally.

   List FOUR reasons why they are used.   (4)

5.2   Complete the following sentences by writing only the missing word or words next to the question number (5.2.1–5.2.3) in the ANSWER BOOK.

   5.2.1   If a hexagon has to be drawn, a … command will be used.

   5.2.2   This command allows you to … or cut an object exactly at an edge defined by another object or line.

   5.2.3   A … command will be used to go back in steps to your previous design.

(3 × 1)   (3)

5.3   To produce a CAD drawing, certain procedures have to be followed.

   List the FIVE procedures.   (5)

5.4   Draw the symbol showing a drawing to be in a first-angle projection.   (3)
[15]

TOTAL: 100