NESA NATIONAL EXAMINATION AND SCHOOL INSPECTION AUTHORITY

WEL – Metal Work

T145

Friday, 23/7/2021

08:30 – 11:30 AM

Names: Marking guide

Index number: .....

TVET NATIONAL EXAMINATIONS, RTQF LEVEL 5, 2020-2021

QUESTIONS and ANSWERS BOOKLET

OPTION/ TRADE : **WELDING**

SUBJECT : **METAL WORK**

ACADEMIC YEAR: **2020-2021**

Read carefully the instructions on page (i) & (ii).

FOR EXAMINER'S USE ONLY

QUESTIONS	1	2	3	4	5	6	7	8	9	10	Total
Marks											
QUESTIONS	11	12	13	14	15	16	17	18	19	20	Total
Marks											
QUESTIONS	21	22	23	24	25	26	27	28	29	30	Total
Marks											

Section I : Attempt all the Twelve (12) questions **(60 marks)**

01. Choose the correct answer: **(5 marks)**

A. A——— Machine is used to cut small pieces of sheet metal.

a) Bending

b) Notching

c) Welding

d) Drilling

e) None of above

B. Both hasp and latch (staple) are fastened on the tool box with:

a) Nut & Bolt

b) Rivets

c) Welding

d) Screws

e) All of the above

C. External screw threads are cut by hand using:

a) Twist drills.

b) Dies.

c) Chisels.

d) Taps.

e) None of the above

D. Hacksaw blades are very soft and easily broken.

a) True

b) False

E. The Bench-vise has ————-jaws

a) Three

b) Two

c) Four

d) One

e) none of the above

02. List at least five Cleaning tools and equipment. **(5 marks)**

03. Define the term "metal forming". **(5 marks)**

04. List at least five (5) advantages of metal forming. **(5 marks)**

05. List disadvantages associated with the hot-working of metals.

(5 marks)

06. Answer by **TRUE** or **FALSE** **(5 marks)**

1. Typical sheet-metal thicknesses are between 0.4 mm (1/64 in) and 6 mm (1/4 in).
2. The sheet-metal products are called stampings.
3. Bending and drawing are used to form sheet metal parts into their required shapes.
4. Cutting is used to separate large sheets into smaller pieces, to cut out part perimeters, and to make holes in parts.
5. The clearance c in a shearing operation is the distance between the punch and die.
6. When thickness exceeds about 6 mm, the stock is usually referred to as plate rather than sheet.
7. The correct clearance depends on sheet-metal type and thickness.
8. Parting is a shearing operation in which blanks are separated from a sheet metal strip by cutting the opposite sides of the part in sequence.
9. Cutoff involves cutting a sheet-metal strip by a punch with two cutting edges that match the opposite sides of the blank.
10. Perforating involves the simultaneous punching of a pattern of holes in sheet metal.

07. Give two (2) main functions of rotating rolls. **(5marks)**

08. Name and draw the types of dies **(5marks)**

09. Define the following terms:

a. Slotting

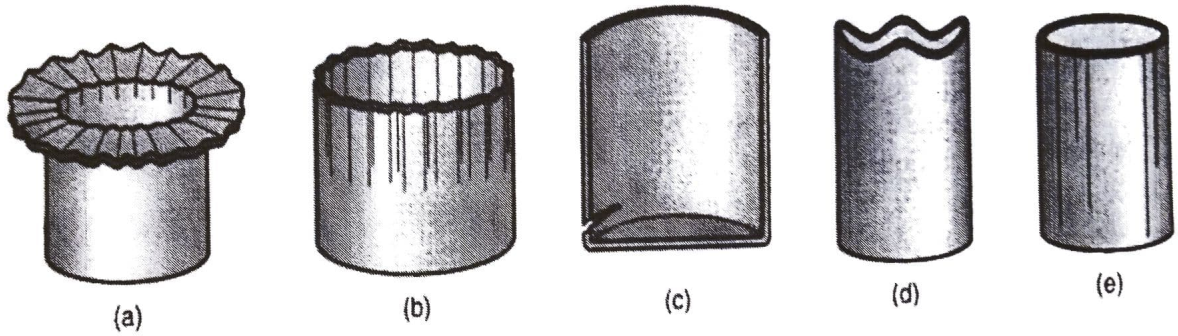
b. Notching

c. Trimming

d. Shaving

e. Fine blanking **(5 marks)**

10. The figures below show the common defects in drawing. Identify each of them. **(5marks)**



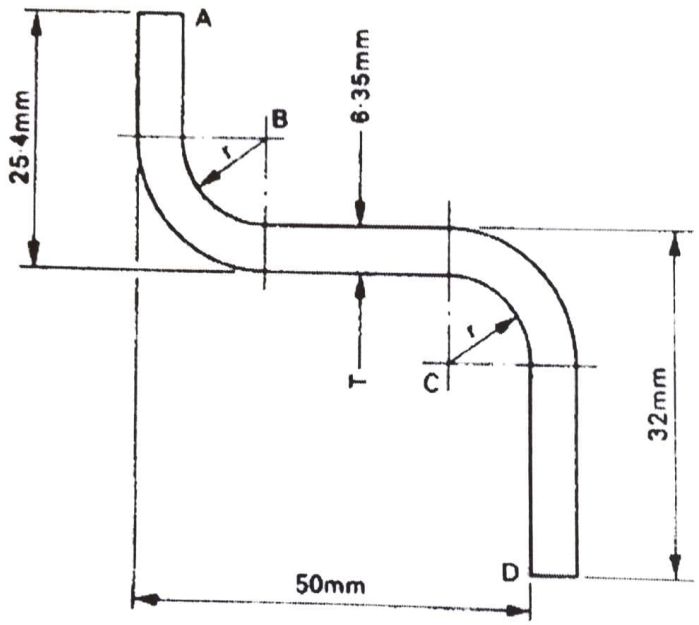
11. Differentiate rolling machine from bending machine. **(5marks)**

12. Describe the difference between profile and sheet metal shape. **(5 marks)**

Section II: Attempt any Four (4) questions out of Six (6) **(40 marks)**

13. Give some of the most crucial six (6) elements of workplace cleaning and list four (4) methods of Protections for the products stored. **(10marks)**

14. Calculate the length of the blank required to form the bracket shown below, using the neutral line value of 0.4 t from the inside bend radius, and given that the metal thickness (t)=6.35 mm and the inside bend radius (r)=2t



(10 marks)

15. a) What do you understand by the term "Drawing" in sheet metal forming?

(4 marks)

b) Identify any three (3) defects in drawing operation. **(6 marks)**

16. Bending is one of sheet metal forming operations. By using neat sketches differentiate the two (2) types of bending. **(10 marks)**

17. Identify five (5) main types of hand tools and give 2 examples for each.

(10 marks)

18. Explain the following joining operations: **(10 marks)**

a) Riveting
b) Welding
c) Soldering
d) Bolting
e) Seamin

Section I

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1) a) e

1 mark/each.

b) d 1

c) b 1

d) a 1

e) b 1

2) * Air compressor
* mop
* cloth rug
* blower
* wire brush

1 mark/each.

3) Metal forming: is the metal working process of fashioning metal parts and objects through mechanical deformation; the workpiece is reshaped without adding or removing material, and its mass remains unchanged.

* Metal forming is the direct alteration of form, surface, and material properties of a workpiece while preserving mass and cohesion.

1/5 marks.

4) advantages of metal forming 1mark/each

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* No wastage of the raw material
* Complex shapes can be produced due to metal forming
* it increase structure stability
* New design of product can be produced due to metal forming
* Metal forming can be used in the place where there is no electricity.

5) Advantages of hot working 1mark/each.

* Heat energy is needed
* poor surface finish material due to scalling of surface
* poor accuracy and dimensional control of parts
* poor reproductivity reproducibility and interchangeability of parts.
* Handling and maintaining of hot metals is difficult and troublesome.
* lower life of tooling and equipment

6) 0.5mark/each.

1. False
2. False
3. True
4. True
5. True
6. True
7. True
8. ~~False~~ False.
9. False
10. True

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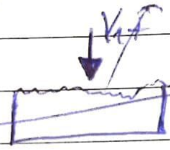
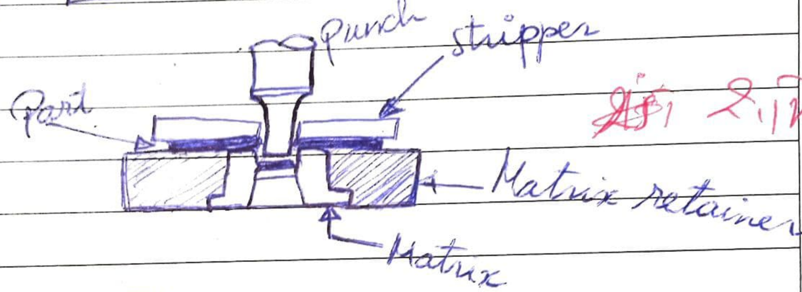
7) two function of rotating rolls.

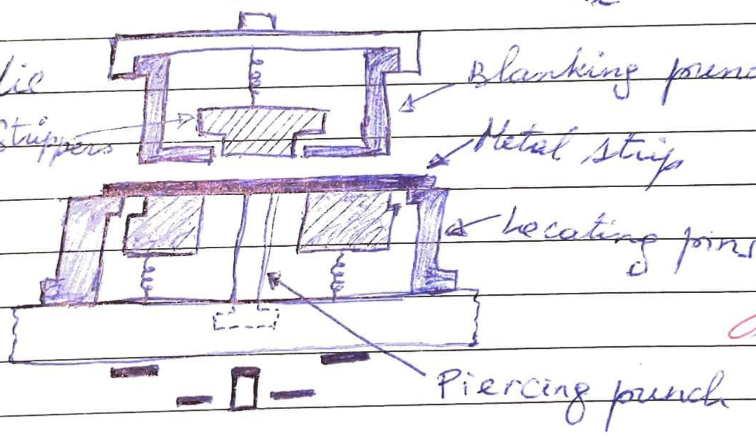
* To maintain diameter of finished products 2.5mark
* used to produce the required shape of the sheet metal required 2.5marks.
* rolls helps in pulling the sheet with out too much humman force.

8) types of dies

~~1. open die:~~ 

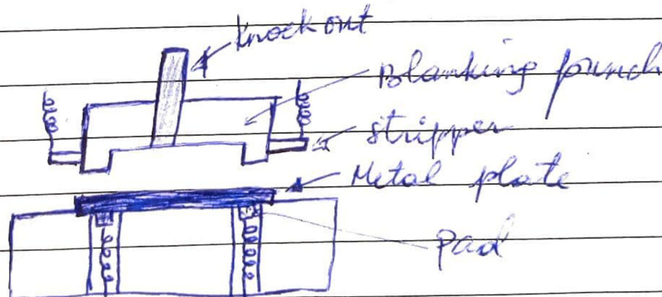
1. Simple die 

~~2.5~~ 2.5mark

2. Compound die 

2.5marks

Two answers are enough.

3. Combination die 

drawing die

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4. Transfer die

5. progressive die

6. open die

7. Impression die

8. flash less die

9)

a) Slotting: is a punching operation that forms rectangular holes in the sheet. 1mark

b) Notching: is ~~the~~ punching the edge of a sheet, forming a notch in the shape of a portion of the punch. 1mark

c) Trimming: is punching away excess material from the perimeter of a part, such as trimming the flange from a steam cup. 1mark

d) Shaving: is ~~shaving~~ shearing away minimum material from the edges of a feature or part, using a small die clearance. 1mark

e) fine blanking: is a specialized type of blanking in which the blank is sheared from the sheet stock by applying 3 separate forces. 1mark

10)

a) Wrinkling in the flange: due to small blank holding force
1 mark

b) Wrinkling in the wall: due to small punch force 1 mark

c) Tearing: due to high blank holding force
1 mark

d) Earing: due to high anisotropy of material
1 mark

e) Surface scratches due to friction and lack of lubrication at the sheet/punch interferance 1 mark.
Only name of defect is enough.

11) Bending machine is a forming machine tool. its purpose is to assemble a bend on a workpiece 2 marks

Rolling machine: is a metal forming fabricate specific configurations out of long strips of metal, most commonly coiled steel.
2 marks

12) profiles: metal profile sheet systems are used to build efficient, reliable and cost efficient envelopes of mostly commercial buildings.
2 marks

Sheet metal: is metal formed by an industrial process into thin, flat pieces.
Sheet metal is one of the fundamental forms used in metalworking, and it can be cut and bent into a variety of shapes 2 marks

Section II

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13) * Air Compressor 1 mark
* Mop 1 mark
* soapy water 1 mark
* bloom 1 mark
* cloth rag 1 mark
* wire brush 1 mark
* ~~Trowel~~ shovel (Sped)

1 mark / each element.

4 method of protection of the product stored.

* galvanization 1 mark
* painting 1 mark
* oiling 1 mark
* Alloying steel 1 mark
* cathodic protection 1 mark
* barrier coatings

14) $t = 6.35mm$

$r = 2t$ 1

Length of flats $AB = 25.4 - (r+t) = 25.4 - (2T+T)$

$= 25.4 - 3T$

$= 25.4 - (3 \times 6.35)$ 1

$= 25.4 - 19.05 = 6.35$

Similary

$CD = 32 - 3T = 32 - 19.05 = 12.95mm$ 1

but: $BC = 50 - (r + t + r)$

$= 50 - (2r + t)$

$= 50 - (4t + t)$ 1

$= 50 - 5t$

$= 50 - (5 \times 6.35) = 18.25mm$

The bend allowance radius

$R = r + 0.4t$

$= 2t + 0.4t$ ✓1

$= 2.4t$

$= 2.4 \times 6.35 = 15.24$ mm

Total length of flat = 13.25 + 12.95 + 6.35 ✓1

Bend allowance for bends BC (90 + 90 = 180° ✓1

Bend allowance $2 (\theta \times R \times (2\pi/360)$ ✓1

where $\theta = 180° - 90° = 90°$

$2 \times 90 \times 15.24 \times 0.0175 = 48$ mm ✓1

Total blank length = 37.55 + 48 = 85.55 mm ✓1

15) a) Drawing: is a common metalworking process performed by manufacturing companies, its able to extend the length of metal by pulling and stretching the metal. its called drawing because the machine draws the metal towards it. as the metal stretches, it becomes longer and thinner. 4marks.

b) 3 defects in drawing: 2 marks/each

* Wrinkling in the flange
* Wrinkling in the wall
* Tearing
* Tearing
* Surface scratches.

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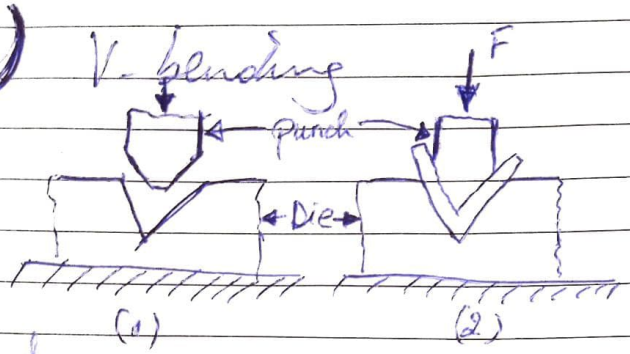
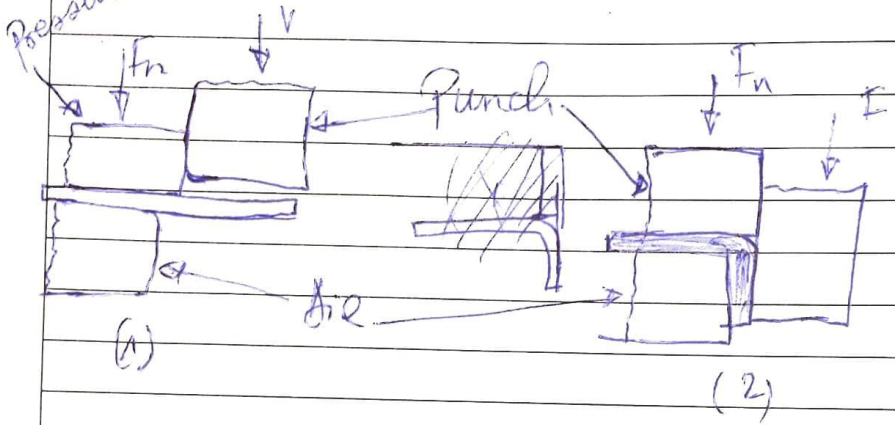
16) V-bending



5mark/each.



edge bending

other bending types: Roll bending, Air bending, flanging, dimpling, press break forming ----,

2marks/each

17) *Cutting tools: file, Chisel
* Marking out tools: Scriber, punch, trammel, divider
* Measuring instruments: tape measure, Vernier caliper, micrometer
* Clamping tools: bench vice, C-clamp, pipe wrench
* Common tools: Spanner, Screw driver, gliter, hammer.

18) a) Riveting: is a forging process that may be used to join parts together by way of a metal part called rivet 2marks

b) Welding is a process for joining two similar or dissimilar metal by fusion with or without the application of pressure and with or without the use of filler metal 2marks

c) Soldering: is a method of joining similar or dissimilar metals by heating them to a suitable temperature and by means of a filler metal called solder having liquidus temperature not exceeding 450°C and below the solidus of the base materials.

2marks

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d) Bolting: is the temporary metal joining process in which two or more pieces may be fixed together by means of bolts and nuts.

2marks

e) Seaming: is a metal working process that uses seam to join two layers.

2 marks.