REPUBLIQUE DU CAMEROUN
Paix-Travail-Patrie
MINISTERE DES ENSEIGNEMENTS SECONDAIRES
CELLULE D'APPUI A L'ACTION PEDAGOG
ANTENNE RÉGIONALE DU NOR
BP : 2183 M
TEL
Email : tru
Web Site :

REPUBLIC OF CAMEROON
Peace-Work-Fatherland
MINISTRY OF SECONDARY EDUCATION
TEACHERS' RESOURCE UNIT
REGIONAL BRANCH FOR THE NORTH WEST
P.O. BOX : 2183 MANKON BAMENDA
TEL : 233 362 209
Email : trubamenda@yahoo.co.uk
Web Site : www.trunorthwest.net

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MARCH 2026

The Teachers' Reso... Pedagogy in ... Inspectorate of ...niques.	SUBJECT CODE NUMBER 5315	PAPER NO 2
TECHNICAL VOCA... EDUCATION INTERMEDIATE ...EVEL REGIONAL MOCK EXAMINATION	SPECIALTY EPS/ELNI/ACRE	
INDUSTRIAL TECHNIQUES.	SUBJECT TITLE ENGINEERING DRAWING	

Time Allowed: **TWO hours**

INSTRUCTIONS TO CANDIDATES

Mobile phones are **NOT ALLOWED** in the examination room.

RECOMMENDATIONS

- *No document is authorized;*
- *The work to be done comprises two independent parts:*
  - ***PART I: Technological study (20 marks) and***
  - ***PART II: Graphical study* (30 marks)**
- *Make sure you have been distributed sheets numbered 1/8 to 8/8; the answers sheets from 6/8 to 8/8 are to be handed to the examiner at the end of the paper, filled or not.*
- *The candidate will answer **4 out of 5** questions in technological study.*
- *All the questions of part I have the same marks which is 5mks*
- ***All the candidates** shall answer the questions in graphical study*
- *This paper is rated as **60 %** of the entire paper*

his paper aims at evaluating the candidates in the following competences:

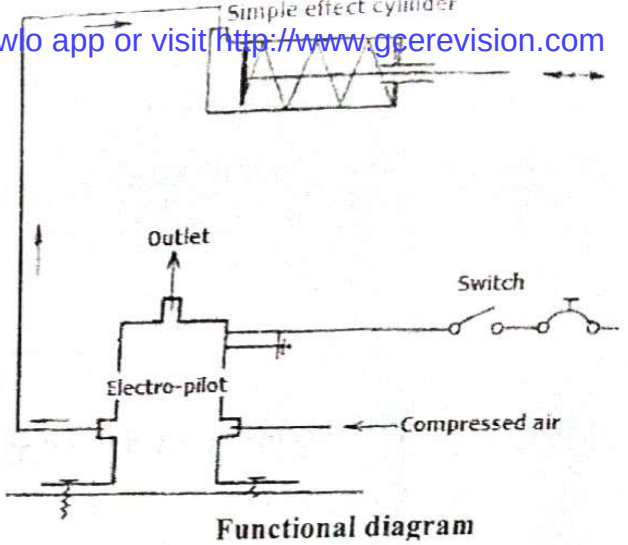
- Identifying and interpreting the functioning of parts;
- Identifying and interpreting mechanical linkages,
- Identifying and calculating fits and tolerances;
- Identifying and designating engineering fasteners;
- Identifying and drawing functioning dimensions;
- Representing / interpreting a piece taken from a functional mechanism.

ou are reminded of the necessity for good English and orderly presentation in your answers.

THEME: ELECTRO-PILOT

I- EXPLANATION OF THE SET-UP

The drawing on page 5/7 shows an electro-pilot drawn to scale 3:2 which is used for controlling a simple effect pneumatic cylinder.



Functional diagram

I- DESCRIPTION AND FUNCTIONING

The functioning of the electro-pilot is done in two phases.

II-1 Phase 1: the circuit is closed

The electrical circuit is established and current crosses the electro-magnet 9, which causes the displacement of the pilot 3 upwards and communicates the orifices 1 and 2 (see assembly on page 5/7).
The orifice 3 is closed by the upper end of the pilot.

The chamber of the cylinder is put under pressure and the piston is displaced to the right. (see functional diagram).

II-2 Phase 2: the circuit is open

The electrical circuit is disrupted and electro-magnet is no more supplied. The spring 6 pushes the pilot downwards obstructing the orifice 1. The orifices 2 and 3 are now in communication.
The spring in the cylinder pushes the piston towards the left and air blocked in the chamber and in the pipes go out through the orifice 3 (see the functional diagram).

II-3 Nomenclature

Ref.	Nbr	Designation	Material	Observation
13	3	Pipe		
12	3	Equipped joint		
11	1	Nut		
10	1	Bonnet		
9	1	Electro-magnet		
8	1	Ring		
7	1	Pivot	35 Ni Cr 6	
6	1	Spring		
5	1	Washer		Glued in 7
4	1	Disc		Glued in 3
3	1	Pilot	100 Cr 6	
2	1	Flue		
1	1	Body	EN AW-2017	

MOCK	ITVE EE/ELNI/FRCL	Session: 2026
Scale: 3:2	ENGINEERING DRAWING	Duration: 2 H
	ELECTRO-PILOT	Coef. : 2
Format: A3V		

WORK TO BE DONE

PART I-TECHNOLOGICAL STUDY (20 marks)

Question 1: Functional analysis and designation of pieces (5 marks)

1-1 Give the role of the flat on the big diameter of piece 3. (Removed section **D-D**).

1-2 Give the role of the two opposite flats on the smooth area of piece 7. (see the removed **section C-C**

1-3 **Designation** of pieces

Body 1 is fixed on the casing with the piece designated **Screw CHC M8 -15.**
Interpret each element of this designation.

Question 2: Knowledge on materials (5 marks)

2-1 Decode the designation **35 Ni Cr 6** of the material of piece 7 by indicating the significance of each element in this designation.

2-2 Indicate the name of the family of materials in which piece 10 belongs by marking an X beside the right answ

Question 3: Study of linkages (5 marks)

Indicate the nature, mode and three (03) characteristics of each of the links 1-7 and 3-1 (by completing or by encircling the right answers on the table).

Question 4: Fit (5 marks)

Given:
- the fit between 1 and 2 is: $\Phi 12\ H7\ m6$;
- the fit between 1 and 3 is: $\Phi 29\ H7\ g6$.

4-1 Calculate the maximum and minimum clearances of the fit between 1 and 2.
4-2 Hence deduce the nature (the type) of fit.

Question 5: Chain of dimensions (5 marks)

5-1 Draw the minimal chain of dimensions related to the condition dimension $\vec{a}$
5-2 Give the equations of the maximum and minimum allowances of $\vec{a}$

PART II- GRAPHIC STUDY (30 marks)

On an A4 V tracing paper, with instruments and pencil, complete to scale 3:2 on ***page 6/6***, the detail drawing of body 1 in the following views:

- Front view section **A-A**;
- ½ top view (do not draw the hidden contours)

➢ Indicate the functional dimensions of all the threaded holes and the fit dimensions on the drawing.

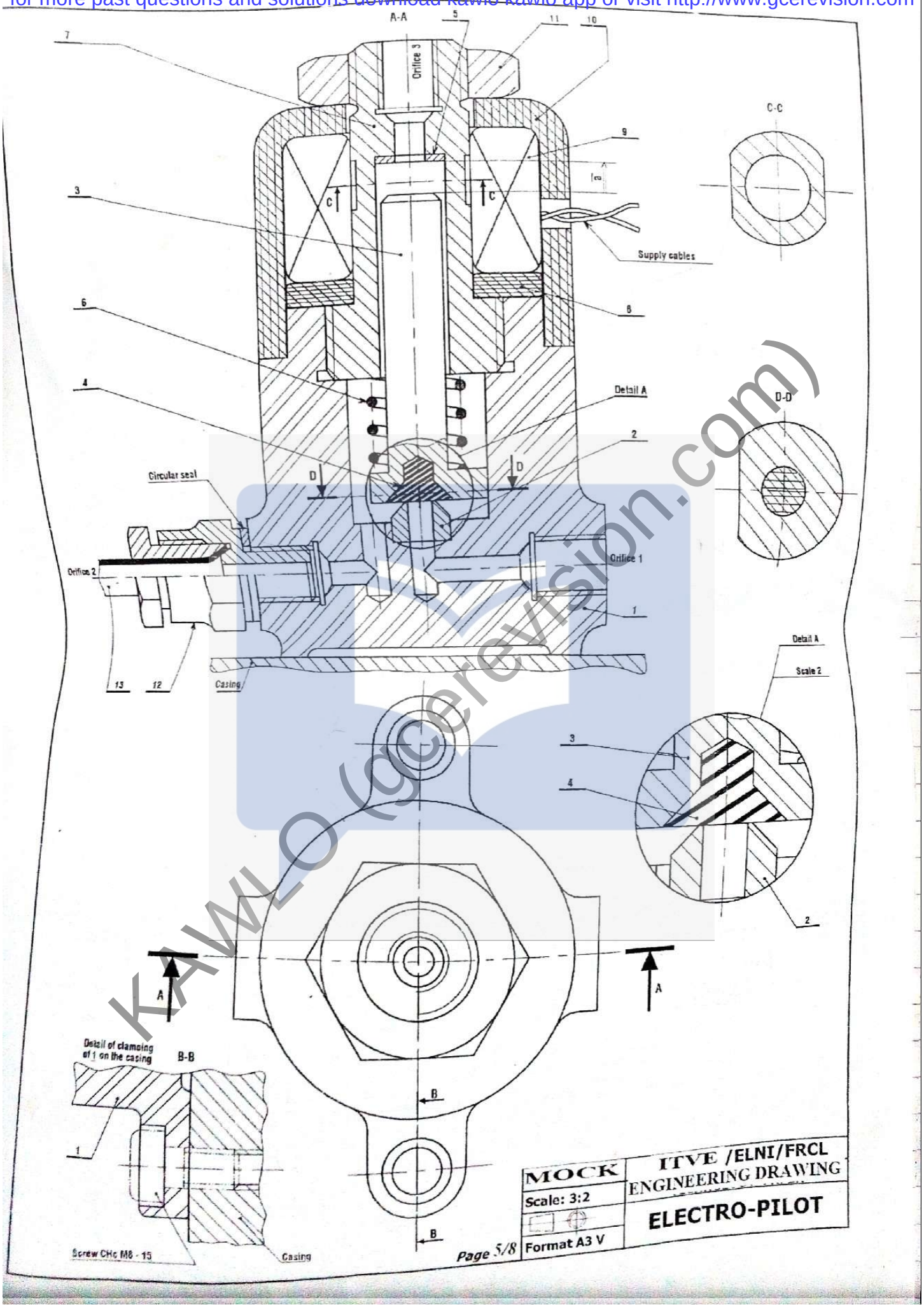
EXTRACT OF TABLE OF TOLERANCES

SHAFTS

Nominal sizes (in mm) NF EN 20286-2. ISO 286-2												
Above to (included)		1 3	3 6	6 10	10 18	18 30	30 50	50 80	80 120	120 180	180 250	250 315	315 400
f6	es ei	-6 -12	-10 -18	-13 -22	-16 -27	-20 -33	-25 -41	-30 -49	-36 -58	-43 -68	-50 -79	-56 -88	-62 -98
f7	es ei	-6 -16	-10 -22	-13 -28	-16 -34	-20 -41	-25 -50	-30 -60	-36 -71	-43 -83	-50 -96	-56 -108	-62 -119
f8	es ei	-6 -20	-10 -28	-13 -35	-16 -43	-20 -53	-25 -64	-30 -76	-36 -90	-43 -106	-50 -122	-56 -137	-62 -151
g5	es ei	-2 -6	-4 -9	-5 -11	-6 -14	-7 -16	-9 -20	-10 -23	-12 -27	-14 -32	-15 -35	-17 -40	-18 -43
g6	es ei	-2 -8	-4 -12	-5 -14	-6 -17	-7 -20	-9 -25	-10 -29	-12 -34	-14 -39	-15 -44	-17 -49	-18 -54
k5	es ei	+4 0	+6 +1	+7 +1	+9 +1	+11 +2	+13 +2	+15 +2	+18 +3	+21 +3	+24 +4	+27 +4	+29 +4
k6	es ei	+6 0	+9 +1	+10 +1	+12 +1	+15 +2	+18 +2	+21 +2	+25 +3	+28 +3	+33 +4	+36 +4	+40 +4
m6	es ei	+8 +2	+12 +4	+15 +6	+18 +7	+21 +9	+25 +9	+30 +11	+35 +13	+40 +15	+46 +17	+52 +20	+57 +21
m7	es ei	+12 +2	+16 +4	+21 +6	+25 +7	+29 +8	+34 +9	+41 +11	+48 +13	+55 +15	+63 +17	+72 +20	+78 +21

HOLES

Nominal sizes (in mm) Tolerances (in microns) 1µm= 0.001 mm													
Above to (included)		1 3	3 6	6 10	10 18	18 30	30 50	50 80	80 120	120 180	180 250	250 315	315 400
H6	ES EI	+6 0	+8 0	+9 0	+11 0	+13 0	+16 0	+19 0	+22 0	+25 0	+29 0	+32 0	+36 0
H7	ES EI	+10 0	+12 0	+15 0	+18 0	+21 0	+25 0	+30 0	+35 0	+40 0	+46 0	+52 0	+57 0
H8	ES EI	+14 0	+18 0	+22 0	+27 0	+33 0	+39 0	+46 0	+54 0	+63 0	+72 0	+81 0	+89 0
H9	ES EI	+25 0	+30 0	+36 0	+43 0	+52 0	+62 0	+74 0	+87 0	+100 0	+115 0	+130 0	+140 0
H10	ES EI	+40 0	+48 0	+58 0	+70 0	+84 0	+100 0	+120 0	+140 0	+160 0	+185 0	+210 0	+230 0



PART I- TECHNOLOGICAL STUDY

Question1: Functional analysis and designation of pieces

1-1 Role of the flat on the big diameter of piece 3. (Removed section **D-D**).

- circle
- bole beri bearing

1-2 Role of the two opposite flats on the smooth area of piece 7. (Removed section **D-D**).

bearing
bole

1-3: Designation of pieces

Interpretation of each of the elements of the designation **Screw CHC M8 -15**:

CHC: 8-15=-7

M: 16

8: M1

15: -15

Question 2: Knowledge on materials

2-1 Decoding the designation 35 Ni Cr 6 of the material of 1:

35: 35+6=41

Ni:

Cr:

6:

2-2 Name of the family of materials in which the material of piece **10** belongs by choosing the right answer.

stainless steel		Bronze		Plastic material	

Question 3: Study of linkages

Nature, Mode and three (03) characteristics of the link between pieces 1-7 and 3-1 respectively (Complete or encircle the right answers on the table)

Linkage	Mode	Nature of linkage			Characteristics of the linkages		
1-7	Pivot Sliding	Pivot	Sliding	Pivot Sliding	Dismountable	Elastic	Partial
		Embedding	Helical	Insert	Rigid	Complete	Permanent
3-1	Elastic	Pivot	Sliding	Pivot sliding	Dismountable	Elastic	Partial
		Embedding	Helical	Insert	Rigid	Complete	Permanent

Question 4: Fit

The Fit between piece 1 and 2 is: $\Phi 12\ H7\ m6$.

4-1 Maxi allowance = _____

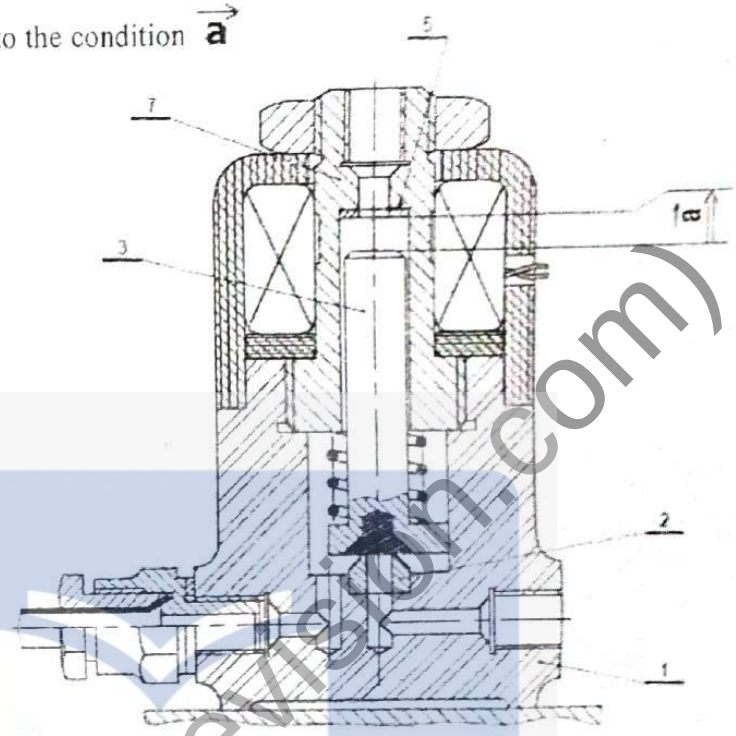
Mini allowance = _____

4-2 Type of corresponding fit. *(Tick the right answer).*

Clearance fit		Transition fit		Interference fit	

Question 5: Chain of dimensions

5-1 Minimal chain of dimensions relative to the condition $\vec{a}$



5-2 Equations of the maximum and minimum sizes of $\vec{a}$

a_{Maxi}= _____

a_{Mini}= _____

PART II- GRAPHIC STUDY

Detail drawing of body 1: