

7218/paper 3 /2025.....

Applied Mechanics/AL

SOUTH WEST REGIONAL MOCK EXAMINATION GENERAL / TECHNICAL AND VOCATIONAL EDUCATION

THE TEACHERS' RESOURCE UNIT (TRU)

Cellule d'appui à l'action Pédagogique

IN COLLABORATION WITH

En collaboration avec

THE REGIONAL INSPECTORATES OF PEDAGOGY AND

THE SUBJECT TEACHERS' ASSOCIATIONS (STA)

Date : WEDNESDAY 26/ 03/2025

ATVE/ LEVEL

Specialty	ELECTRICAL POWER SYSTEMS-EPS (F3) & ELECTRONICS-ELNI (F2)
Subject Title	ELECTRICAL/ELECTRONICS APPLIED MECHANICS
Subject Code Number	7218
Paper Number	3

...3.... HOURS

INSTRUCTIONS TO CANDIDATES:

This paper carries ...5.. SECTIONS. Answer any ...ALL..... questions.

Each question carries 10.....marks. For your guidance, the approximate mark for each part of a question is indicated in brackets.

If you answer MORE THAN..... (...1...) questions, ONLY the first (...) answers presented will be marked and the other cancelled.

You are allowed to use ...CALCLATORS.....

However, programmable calculators ARE NOT ALLOWED.

You must use ONLY Blue or Black ink.

All Appendices filled or completed should be handed in with your answer booklet.

All necessary calculations must be shown.

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

You are advised to read carefully through the question paper, before you begin your answers.

Theme. LIFTING TABLE

SETTING UP

The lifting table presents on the figure 1 (in projection) and figure 2 (plane) is used to carry the loads in the company stores.

DESCRIPTION AND FUNCTIONNING

THE SUPPORT 1

The support [0], which carried the desk [1] (work table). the lifting movement is commanded by two symmetric pair of arms, ([2+3] and [2'+3']). The arms are articulated between themselves at C and C'. the arm [2] is articulated at E on the support [0] and the arm [3] at B on the table [1]. The desk is in contact at R on a pair of roller [7] and [7'], the rollers are articulated at A on the arms [2] and [2'] and moving in the direction (AB) relative to [1]. In the same way the rollers [6] and [6'] articulated at S on the arms [3] and [3'], in contact at F on the support and translate horizontally in the direction (SE). these rollers ensure the equilibrium of the system.

- The lifting effort is giving by the hydraulic jack [4+5] (4 = rod, 5 = body) which in contact at D on [0] and at H on [2].
- The desk is in equilibrium in the position of the figure [2].





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SECTION A STATICS

/25MARKS

Hypothesis and data

- The links a, b, c, d, e, s and h are pivot links which the center bears the same name.
- The study is carry out in the plane of symmetry of the. The shall identify a group of pieces by the same reference.
- The weights of pieces are neglected.
- The coefficient of friction between [7] and [1], and at F between [6] and [0] is $f = 0,18 (\varphi \approx 10^\circ)$.
- $\bar{A}(2000daN)$ is the weight of the total load [8] to lift.

1. Study of part [1]

1-1. Draw the free body diagram of the table [1] and graphically determine the mechanical action applied at r and b.

6mks

2 Study of parts [3+6].

2.1 Determine the mechanical action at C and F..

6mks

3 study of parts [4+5]

3.1 Deduce the support of the action force at H.

2mks

4 study of parts [2+7]

4-1 Fill the table bill of forces applies.

3mks

4-2 Determine graphically the action force apply at h and e.

8mks

SECTION B KINEMATICS

/15MARKS

Hypotheses and data

- The system occupies the position of the figure 3.
- Scale of velocity : 1mm for 1,2mm/s

1. Give the nature of the movement of 4 relative 5 .

1mk

2. Knowing that the rod [4] of the jack [5] set out with a velocity of 60mm/s, draw the $\overrightarrow{V_{H4/5}}$

0,5mk

3. Give the nature of movement [2] relative to [0] .

1mk

4. Give the nature of movement of [5] relative of [0]

1mk

5. Deduce and draw the support of the velocities $\overrightarrow{V_{H2/0}}$ and $\overrightarrow{V_{H5/0}}$,

4mks

6. Give the value of $\overrightarrow{V_{H2/4}}$. Then justify.

2x1,5mks

7. Writhe the relation of composition of velocities at point H

0,5mk

8. Deduce graphically $\overrightarrow{V_{H2/0}}$.

1mk

9. By equiprojectivity, determine $\overrightarrow{V_{C2/0}}$, take $\|\overrightarrow{V_{H2/0}}\| = 62,4mm/s$,

3mks

SECTION D DYNAMICS

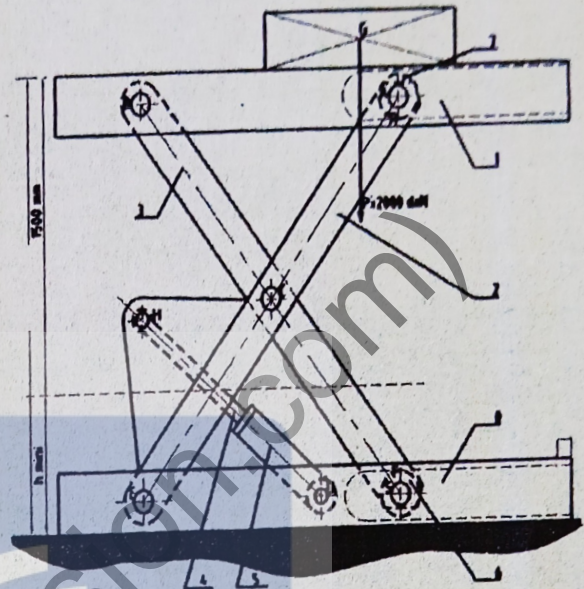
/10MARKS

The distance covered by the load from down to the final position is 1500mm, the load weighted 2000daN.

The lifting duration is 20 second

The operation is carried out with constant velocity.

1. Determine the linear velocity 2mks
2. Give the equation of motion, 1mk
3. Determine the kinetic energy when the table is totally lifted, 2mks
4. Determine the potential energy when the load reach the high position (1500mm), 2mks
5. Deduce the work done by the lift, 1mk
6. Determine the power of the lift. 2mks

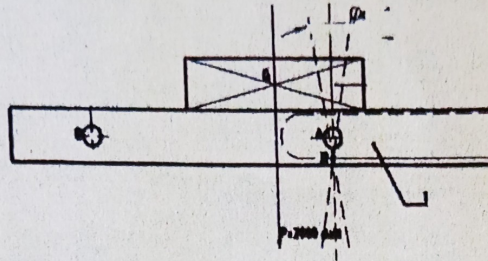


ANSWER SHEET

SECTION A STATICS

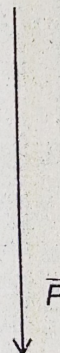
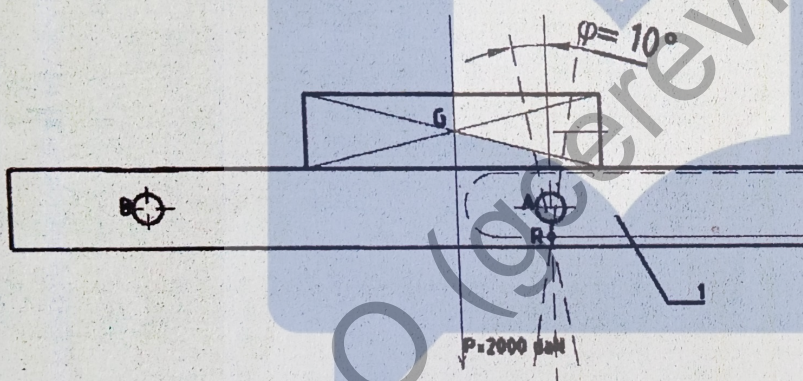
1. Study of part [1].

1.1. a. Free body diagram of the table [1] ;



1.1. b Graphical determination of the mechanical action applied at R and B

Scale of forces: 1mm \Leftrightarrow 40 daN



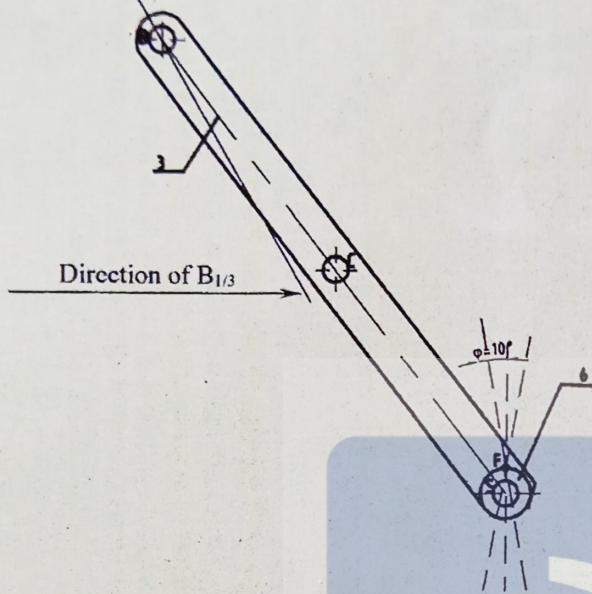
$$\|R_{1/1}\| = \quad , \quad \|B_{3/1}\| = \quad$$

ANSWER SHEET

2. Study of parts [3+6].

Determination of the mechanical action at C and F

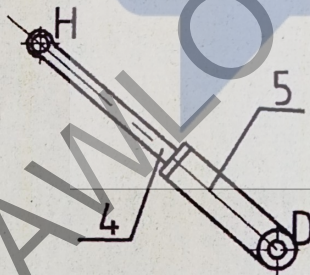
Given $\|\vec{B}_{1/3}\| = 520 \text{ daN}$. Scale of forces: $1 \text{ mm} \Leftrightarrow 40 \text{ daN}$



3 Study of parts [4+5]

Deduction of the support of the action force at H.

$$\|\vec{C}_{2/3}\| = \text{---}, \quad \|\vec{F}_{0/6}\| = \text{---}$$



3 Study of parts [2+7]

Fill the table bill of forces applies and graphically determine the action forces at H and E.

Given $\|\vec{R}_{1/7}\| = 1560 \text{ daN}$, $\|\vec{C}_{3/2}\| = 1440 \text{ daN}$.

The diagram shows a mechanical linkage system. A horizontal member is pivoted at point A. A vertical member is pivoted at point B. A connecting member is pivoted at point C on the horizontal member and point D on the vertical member. A force F is applied at point E on the connecting member. The direction of the force F is indicated by a dashed line and an angle $\phi = 10^\circ$. The direction of the force $\vec{C}_{2/3}$ is also indicated. The diagram is labeled with (HD) and (H).

Forces	P.A.	Direction	Sens	module

Forces	P.A.	Direction	Sens	module

 $\bar{C}_{3/2}$

P

$$\|\overline{H_{4/2}}\| =$$

$$\|\overline{E_{9/2}}\| =$$

ANSWER SHEET

SECTION B KINEMATICS

1. Nature of the motion of part 4 relative to 5

2. Drawing the velocity $\overline{V_{H4/5}}$

3. Nature of the motion of part 2 relative to 0

4. Nature of the motion of part 5 relative to 0

5. Deduction and drawing of the support of the velocities $\overline{V_{H2/0}}$ and $\overline{V_{H5/0}}$

6. $\|\overline{V_{H2/4}}\| =$

Then justification

7. Relation of composition of velocities at point H

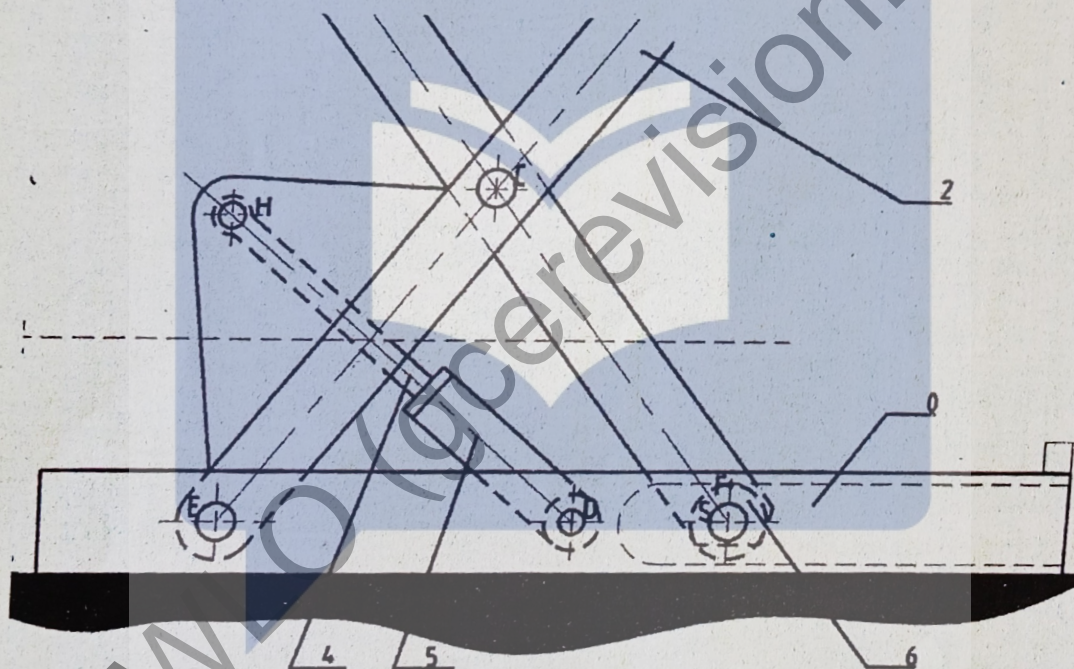
8. Graphical Deduction of

$\overrightarrow{V_{H2/O}}$

9. Determine by equiprojectivity method the

velocity $\overrightarrow{V_{C2/O}}$

ANSWER SHEET



SECTION C DYNAMICS

1. Determination of the linear velocity

2. equation of motion,

3. Determination of the kinetic energy when the table is totally

ANSWER SHEET

4. Determination of the potential energy when the load reach the high position,



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6. Determination of the power of the lift

5. Reduction of the work done by the lift