GENERAL CERTIFICATE OF EDUCATION BOARD

Technical and Vocational Education Examination

JUNE 2026 **ADVANCED LEVEL**

Specialty Name and Acronym	**ELECTRICAL POWER SYSTEM-EPS (F3) & ELECTRONICS-ELN (F2)**
Subject Title	**Electrical/Electronics Applied Mechanics**
Subject Code No.	**7218**
Paper No.	**2**

Duration: Three hours

QUESTION BOOKLET

INSTRUCTIONS TO CANDIDATES

- The Paper Comprises **Seven** Questions
- **Answer Five (05) Questions as follow:**
  - **Section A**: VECTORS, FORCES, MOMENTS & STATICS: **Candidates should choose 2 out of 3 questions**
  - **Section B**: KINEMATICS: **2 compulsory questions**
  - **Section C**: DYNAMICS & ENERGETICS: **Candidates Should Choose Only One Question**
- Illustrate your Answers with neat sketches wherever necessary
- Preferably, write the Answers in Sequential order
- Use of Non-Programmable Calculator is permissible
- This Paper carries **60%** of the mark

Read carefully through the question paper, before you begin your answers.

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

Section A: VECTORS, FORCES, MOMENTS & STATICS

QUESTION 1: (10 marks)

1. Figure 1.a below represents three forces F_1, F_2 and F_3 applied on a screw eye.
   a- Express the cartesian components of each force. **(3 marks)**
   b- Determine the cartesian components of the resultant R of those three forces. **(2 marks)**
   c- Deduce the magnitude of the resultant R. **(1 mark)**

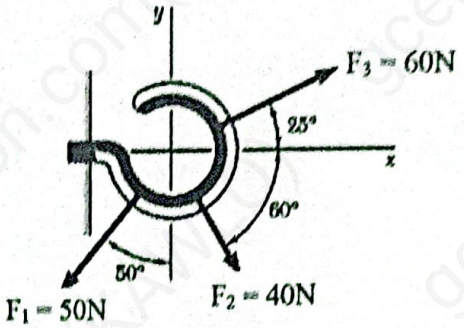


Figure 1.a

2. A 110N force acting in a vertical plane parallel to the yz plane is applied to the 220mm long horizontal handle AB of a socket wrench as shown in figure 1b.

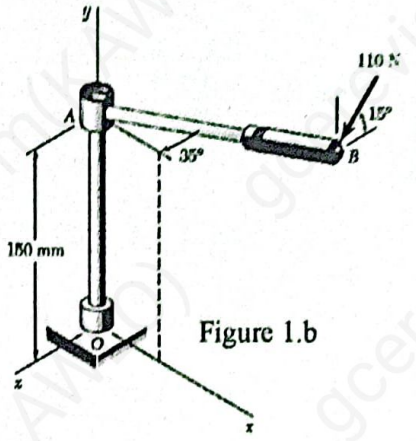


Figure 1.b

   a. Express the cartesian coordinates of vector $\overrightarrow{OB}$. **(1 mark)**
   b. Determine the cartesian components of the force F = 110N acting on the handle. **(1 mark)**
   c. Calculate the magnitude of the moment of the force F about point O. **(2 marks)**

QUESTION 2: (10 marks)

As an air plane's brakes are applied, the nose wheel exerts two forces on the end of the landing gear as shown in figure 2a.

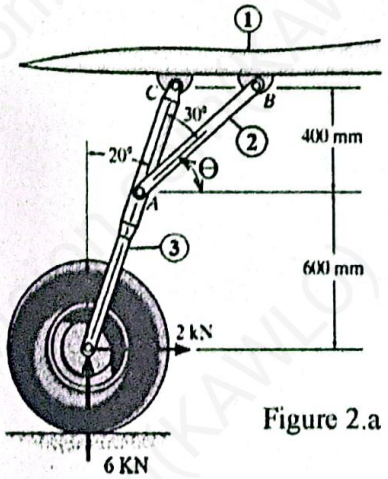


Figure 2.a

1. Determine the angle Θ of the strut AB with the horizontal axis. **(1 mark)**
2. Write the equations of equilibrium of the strut 2. **(2 marks)**
3. Apply the fundamental principle of statics to the shock absorber 3 and determine analytically the tension T in the strut 2. **(7 marks)**

QUESTION 3: (10 marks)

For the boom and loading shown in the figre 3a. below:

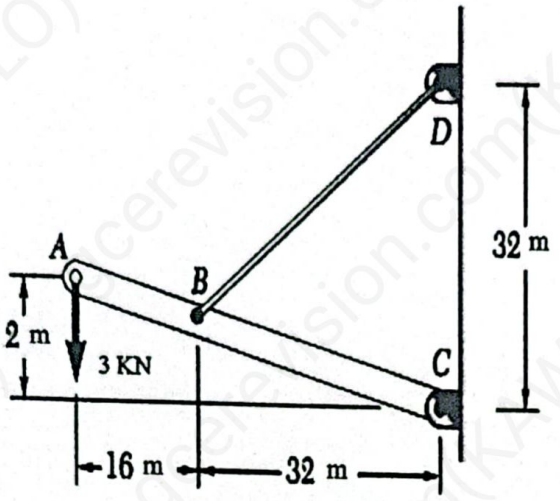


Figure 3.a

1.
   a. State the fundamental principle of statics applied to a body subjected to two forces. **(2 marks)**
   b. Draw the line support of the forces applied at B and C to the rod AB. **(1 mark)**
   c. Determine graphically the magnitude of the forces applied to the boom at points B and C
      Take: scale of forces $1mm \Rightarrow 100N$ **(3 marks)**

2.
   a. Calculate the angle Θ of the rod BD with the horizontal axis. **(1 mark)**
   b. Compute the distance d (figure 3b.) **(1 mark)**
   c. Using the free body diagram of the boom (figure 3d) determine analytically the magnitude of the forces at B and C. **(3 marks)**

Section B: KINEMATICS: **2 compulsory questions**

QUESTION 4: (10 marks)

A car is moving along a straight horizontal road. At the time t = 0s, the car passes a point A with a speed of 30m/s. The car moves with this speed until t = 10s at point C. The car then decelerates uniformly for 6s at point D. At time t =16s, the speed of the car is V = 15*m/s* and this speed is maintained until the car reaches the point B at time t = 20s.

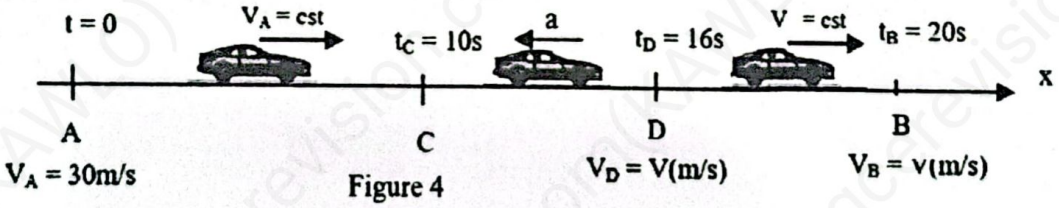


Figure 4

1. Write the equation of the motion of the car during the 1st phase AC. **(1 mark)**
2. Calculate the distance covered AC during the 1st phase. **(1 mark)**
3. Write the equation of the velocity V_D at the end of the 2nd phase . **(2 marks)**
4. Deduce the deceleration of the car. **(2 marks)**
5. Calculate the distance CD. **(2 marks)**
6. Determine the distance covered DB during the last phase. **(2 marks)**

QUESTION 5: (10 marks)

Figure 5a below shows the system which ensures the opening of a truck bucket collecting refuse.
The outlet velocity of the rod 2 compared to the jack body 1 is $\|\overrightarrow{V_{B2/1}}\| = 0.1m/s$.

Scale of velocities: $3cm \Rightarrow 0.1m/s$

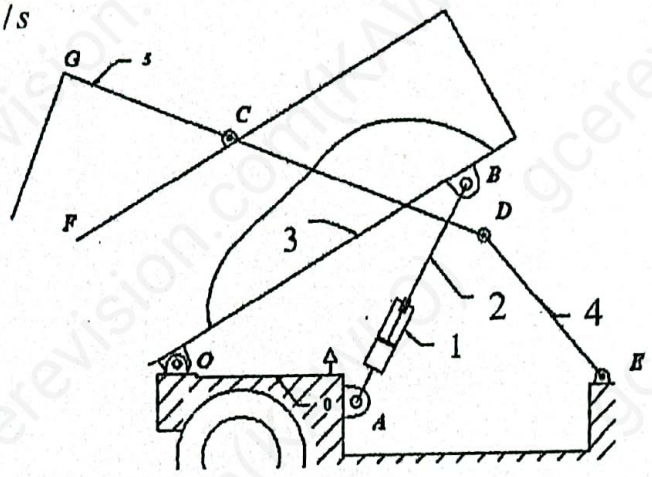


Figure 5a

1. Identify the nature of the following motions: **(1.5 marks)**
   a. $M^{vt}2/1$
   b. $M^{vt}1/0$
   c. $M^{vt}3/0$
2. Represent graphically $\overrightarrow{V_{B2/1}}$. **(1 mark)**
3. Indicate and draw the line support of the following velocities: **(2 marks)**
   a. $\overrightarrow{V_{B1/0}}$
   b. $\overrightarrow{V_{B3/0}}$
4. Justify the equality $\overrightarrow{V_{B2/0}} = \overrightarrow{V_{B3/0}}$. **(0.5 mark)**
5. Knowing that $\overrightarrow{V_{B3/0}} = \overrightarrow{V_{B2/1}} + \overrightarrow{V_{B1/0}}$, determine graphically the magnitude of $\overrightarrow{V_{B2/0}}$ and $\overrightarrow{V_{B2/0}}$. **(2.5 marks)**
6. Determine graphically by using the equiprojectivity of velocities method the magnitude of $\overrightarrow{V_{F0/0}}$. **Take:** $\|\overrightarrow{V_{B3/0}}\| = 0.2m/s$ **(2.5 marks)**

Section C: DYNAMICS & ENERGETICS: Candidates should choose only one question

QUESTION 6: (10 marks)

An electric motor rotates at a speed of 1500 rev/min when a constant torque of 20 Nm is applied on a receiver.

1. Determine the angular speed of the electric motor. **(2 marks)**
2. Find the power developed during its motion. **(2 marks)**
2. Compute the forces applied if the diameter of the motor shaft is 100mm. **(2 marks)**
3. Calculate the kinetic energy developed by the electric motor. Take $J_G = 0.05 kg.m^2$. **(2 marks)**
3. Apply the theorem of kinetic energy and determine the angular displacement Θ of the electric motor. **(2 marks)**

QUESTION 7: (10 marks)

A light lift cargo car of mass **1200 kg** is moving down a slope of angle $\theta = 10°$. The cargo is brought to rest from **80 km/h** within a distance of **50 m**. Take $g = 10 m/s^2$.

1. Calculate the potential energy of the cargo at rest. **(2 marks)**
2. Determine the deceleration 'a' of the cargo. **(2 marks)**
3. What is the kinetic energy of the cargo at rest. **(1 marks)**
4. Use the kinetic energy theorem to compute the average braking force 'F' required to bring the cargo to rest. **(2.5 marks)**
5. Calculate the average braking force 'F' using the fundamental principle of dynamic in translation. **(2.5 marks)**

REGISTRATION CENTRE NUMBER	CENTRE NAME
CANDIDATE'S FULL NAMES	
CANDIDATE IDENTIFICATION NUMBER	SUBJECT CODE 7218 / PAPER NUMBER 2
FOR OFFICIAL USE ONLY (Candidate Random CODE): ▶	

GENERAL CERTIFICATE OF EDUCATION BOARD

Technical and Vocational Education Examination

Advanced Level

SUBJECT TITLE	SUBJECT CODE	PAPER NUMBER
Electrical/ Electronics Applied Mechanics	**7218**	**2**
	EXAMINATION DATE: **JUNE 2026**	

Duration: Three Hours

ANSWER BOOKLET

INSTRUCTIONS TO CANDIDATES

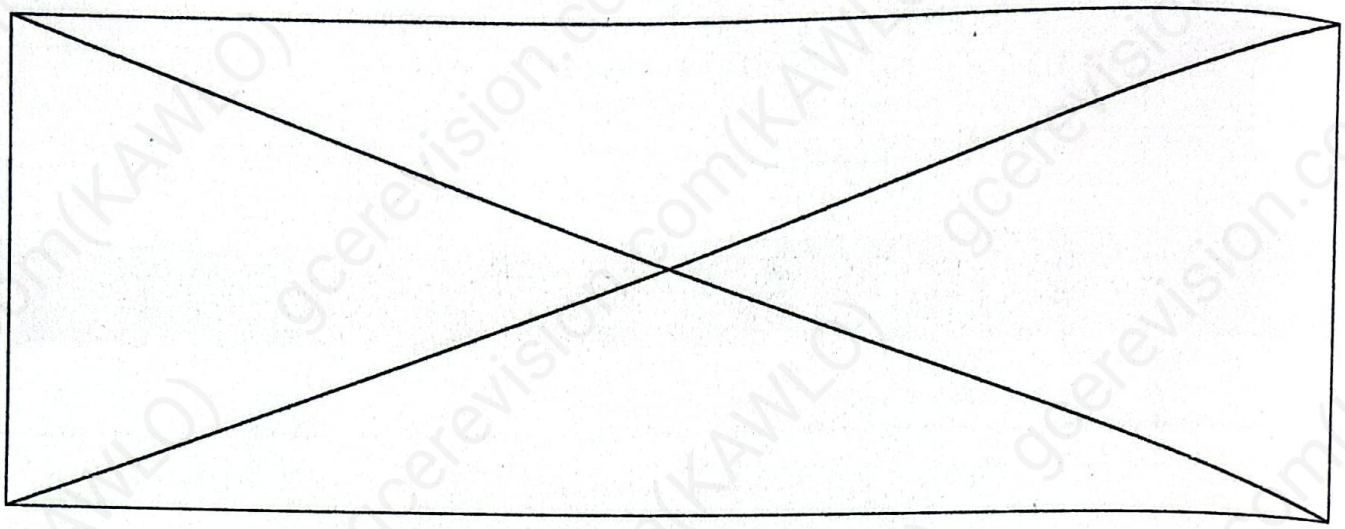
Illustrate your Answers with neat Sketches where necessary.

Answer ALL Questions in this "Answer Booklet".

Read carefully through the question paper, before you begin your answers.

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

FOR EXAMINERS' USE ONLY	***SCORE***
Marked by: ..... *Signature:* ..... *Date:*	
Checked by: ..... *Signature:* ..... *Date:*	



Section A: VECTORS, FORCES, MOMENTS & STATICS
(Answer only two questions out of three)
QUESTION 1

1.

a- Express the Cartesian components of each force:

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b- Determine the Cartesian components of the resultant **R** of those three forces:

Rx = ...
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Ry = ...
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c- Deduce the magnitude of the resultant **R**:

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2.

a. Express the Cartesian coordinates of vector $\overrightarrow{OB}$:

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b. Determine the Cartesian components of the force F = 110N acting on the handle:

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.....

c. Calculate the magnitude of the moment of the force F about point O:

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QUESTION 2

1. Determine the angle θ of the strut AB with the horizontal axis.

2. Write the equations of equilibrium of the strut 2.

3. Apply the fundamental principle of statics to the shock absorber 3 and determine analytically the tension T in the strut 2.

Equilibrium equations:

$\sum F_x = 0$;

$\sum F_y = 0$;

Calculate the distance d (in mm):

d =

Deduce the distance a knowing that $\frac{a}{400} = \frac{d}{1000}$;

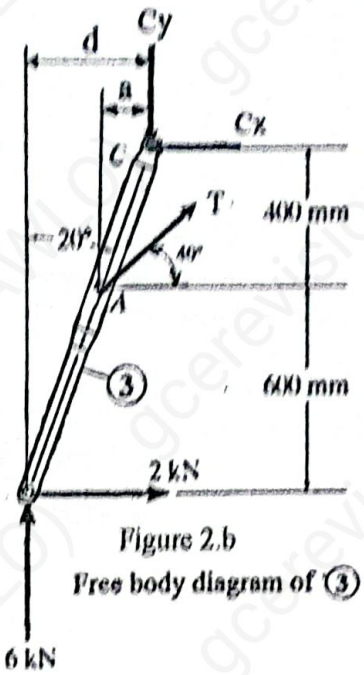

Figure 2.b
Free body diagram of (3)

$\sum M_C = 0$;

Take: d = 364mm; a = 146mm

T =

QUESTION 3

1. For the boom and loading shown in the figure 3a. below

a. State the fundamental principle of statics applied to a body subjected to two forces:

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b. Draw the line support of the forces applied at B and C to the rod AB:

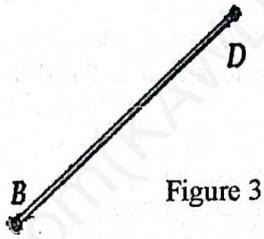

Figure 3.a

a. Determine graphically the magnitude of the forces applied to the boom at points B and C
Scale of forces $1mm \Rightarrow 100N$

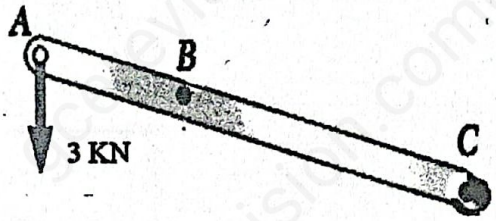

Figure 3b.

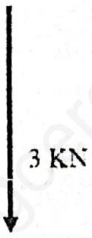

Figure 3c.

2.

a. Calculate the angle Θ of the rod BD with the vertical axis:

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b. Calculate the distance d knowing that $\frac{d}{32} = \frac{1}{24}$: .....

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c. Using the free body diagram of the boom (figure 3d) determine analytically the magnitude of the forces at B and C
Take d = 1.33 m; θ = 37°

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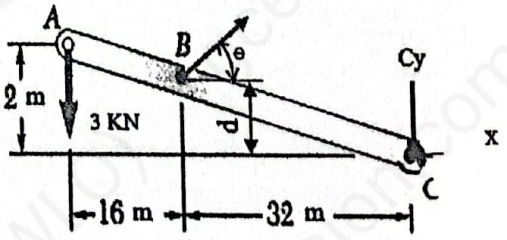

Figure 3d: Free body diagram of the boom

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Section B: KINEMATICS: 2 Compulsory Questions

QUESTION 4

1. Write the equation of the motion of the car during the 1st step AC:

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2. Calculate the distance covered AC during the 1st phase:

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3. Write the equation of the velocity V_D at the end of the 2nd phase:

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4. Deduce the deceleration of the car:

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5. Calculate the distance CD:

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6. Determine the distance covered DB during the last phase:

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QUESTION 5

1. Identify the nature of the following motions:
   a. $M^{vt}2/1$: .....
   b. $M^{vt}1/0$: .....
   c. $M^{vt}3/0$: .....
2. Represent graphically $\overrightarrow{V_{B2/1}}$ .....
3. Indicate and draw the line support of the following velocities:
   a. Line support of $\overrightarrow{V_{B1/0}}$: .....
   b. Line support of $\overrightarrow{V_{B3/0}}$:
   .....
4. Justify the equality $\overrightarrow{V_{B2/0}}=\overrightarrow{V_{B3/0}}$:
   .....
5. Knowing that $\overrightarrow{V_{B3/0}}=\overrightarrow{V_{B2/1}}+\overrightarrow{V_{B1/0}}$, determine graphically the magnitude of $\overrightarrow{V_{B2/0}}$ and $\overrightarrow{V_{B2/0}}$:
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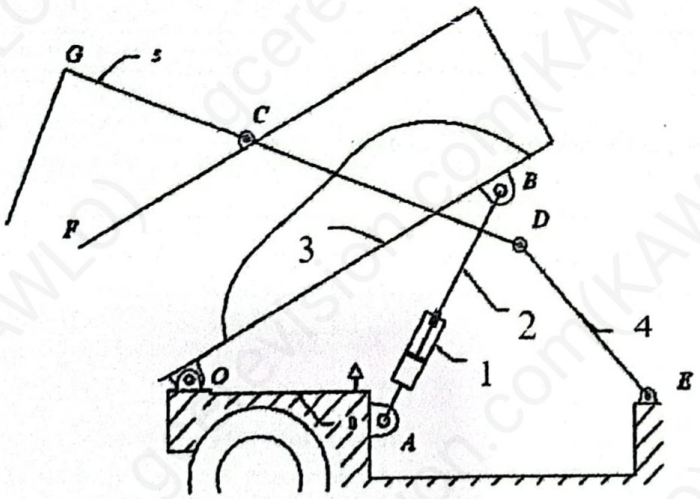

Figure 5b

6. Determine graphically by using the equiprojectivity of velocities method the magnitude of $\overrightarrow{V_{F3/0}}$.
   Take: $\|\overrightarrow{V_{B3/0}}\|=0.2m/s$; **scale of velocities:** $3cm \Rightarrow 0.2m/s$
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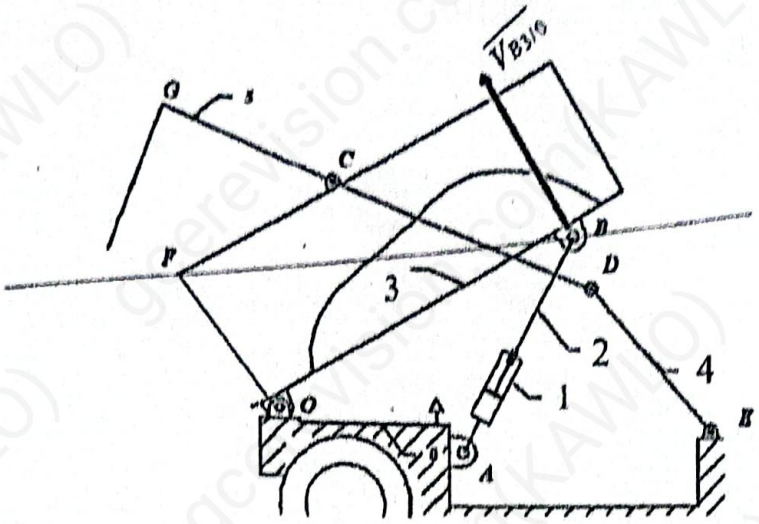

Figure 5c

Section C: DYNAMICS & ENERGETICS: Candidates should choose only one question

QUESTION 6

1. Determine the angular speed of the electric motor:

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2. Find the power done during its motion:

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3. Compute the couple of force applied if the diameter of the motor shaft is 100 mm:

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4. Calculate the kinetic energy developed by the electric motor. Take $J_G = 0.05 kg.m^2$:

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5. Apply the theorem of kinetic energy and determine the angular displacement Θ of the electric motor:

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QUESTION 7

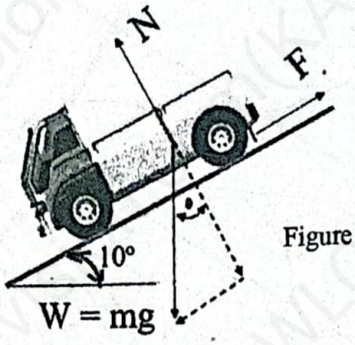

Figure 7: Free body diagram of the cargo.

1. Calculate the potential energy of the cargo at rest:

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2. Determine the deceleration 'a' of the cargo:

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3. What is the kinetic energy of the cargo at rest:

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4. Use the kinematic energy theorem to compute the average braking force 'F' required to bring the cargo to rest:

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5. Calculate the average braking force 'F' using the fundamental principle of dynamic in translation:

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