535/1
PHYSICS
Paper 1
29th Jan. 2021

Uganda Certificate of Education
TOPICAL REVISION QUESTIONS SET 1
OLEVEL PHYSICS

Paper 1
Topic: Machines

NAME: _____ **STREAM:** _____

INSTRUCTIONS:

Answer all questions in this paper.

Mathematical tables, side rulers and silent non-programmable calculators may be used.

These values of physical quantities may be useful to you.

Acceleration due to gravity	=	$10\ \text{m s}^{-2}$
Specific heat capacity of water	=	$4200\ \text{J kg}^{-1}\ \text{K}^{-1}$

SECTION A: (17 Marks)

Answer **all** *questions in this section.*

Question 1:

Figure 5 shows the variation of efficiency and load of a block and tackle system.

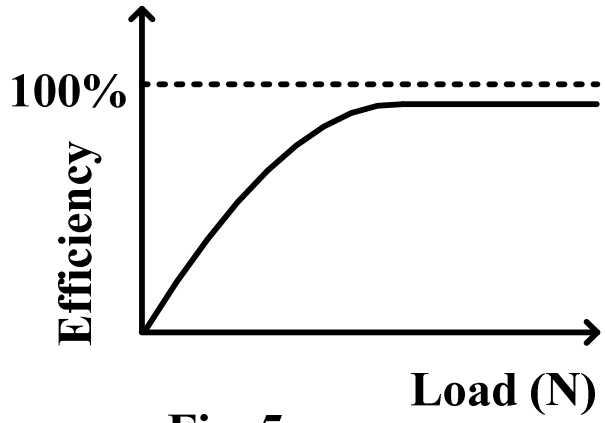


Fig. 5

Which of the following is correct about the graph?

(i). Increase in the load increases efficiency.
(ii). The velocity ratio limits the meachanical advantage and efficiency is less than 100%.
(iii). At high loads, efficiency decreases.

A. (i) and (ii) only.
B. (i) and (iii) only.
C. (ii) and (iii) only.
D. (i), (ii) and (iii).

Question 2:

The mechanical advantage of a simple machine may be increased by

(i). increasing the load.
(ii). increasing weight of movable parts of the machine.
(iii). reducing friction between moving parts.

A. (i) and (ii) only.
B. (i) and (iii) only.
C. (ii) and (iii) only.
D. (i) only.

Question 3:

Which one of the following is a set of machines that depends on turning effects of forces for their operation?

A. The lever, gears and wedges.
B. Hydraulic press, wheel barrow and spanners.
C. Spanners, pulleys and wedges.
D. The lever, spanners and hammers.

Question 4:

Which of the following are second class levers?

(i). Sea saw.
(ii). Wheel barrow.
(iii). Pair of tongs.
(iv). Nut cracker.

A. (i) and (ii) only.
B. (ii) and (iii) only.
C. (iii) and (iv) only.
D. (ii) and (iv) only.

Question 5:

It is easier to use a claw hammer to remove a nail from a piece of wood if the handle is longer because the

A. effort applied becomes bigger.
B. turning effect becomes bigger
C. anticlockwise moments will balance clockwise moments.
D. fulcrum is between the effort and the load.

Question 6:

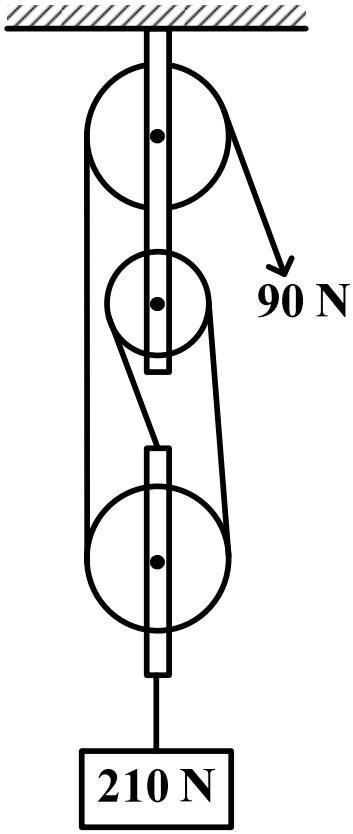


Fig. 1

Calculate the efficiency of the pulley system shown in Figure 1 if the minimum effort needed to raise a load of 210 N is 90 N.

A. $\frac{90}{210 \times 3 \times 100}$

B. $\frac{90 \times 3}{210 \times 100}$

C. $\frac{210 \times 3 \times 100}{90}$

D. $\frac{210 \times 100}{90 \times 3}$

Question 7:

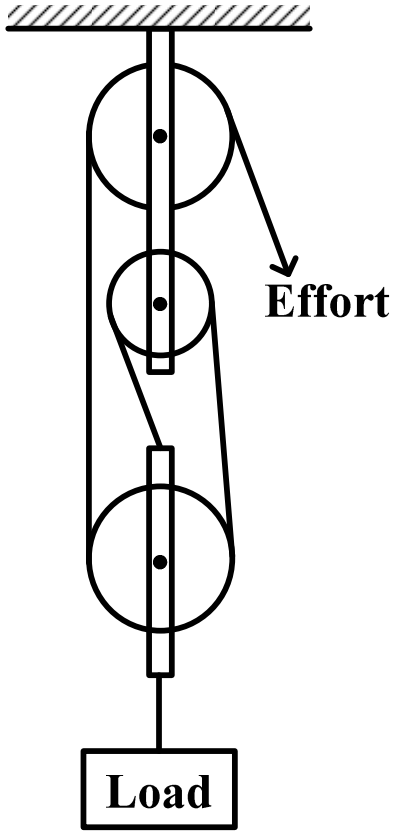


Fig. 3

What is the velocity ratio of the pulley system shown in Figure 3?

A. 1
B. 2
C. 3
D. 4

Question 8:
The maximum efficiency that can be obtained with four pulleys and a mechanical advantage of 3 is?

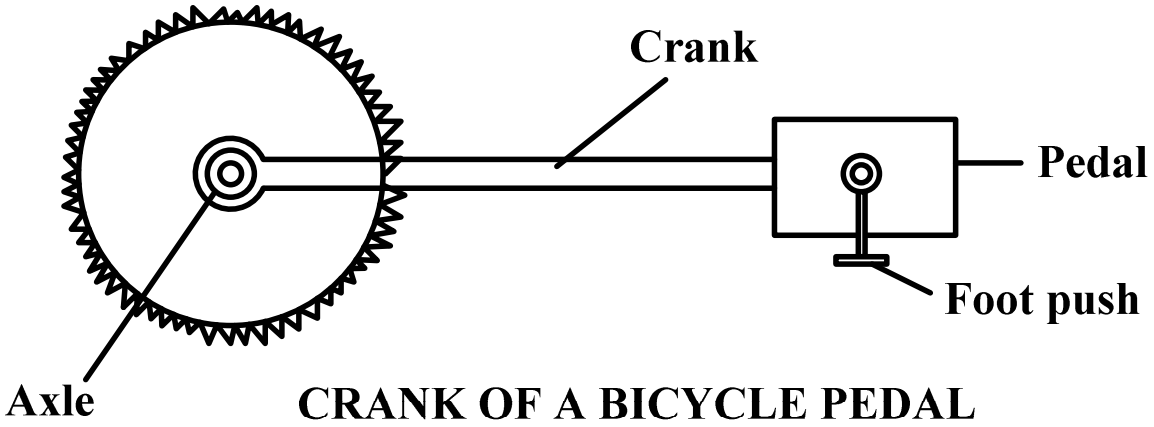
A. 100%
B. 75%
C. 12%
D. 1.33%

Question 9:
Calculate the effort when a load of 72 N is raised using a block system of 5 pulleys and efficiency 80.

A. 11.52 N
B. 18 N

C. 57.6 N
D. 288 N

Question 10:



CRANK OF A BICYCLE PEDAL

Fig. 2

The above figure shows a crank of a bicycle pedal. The force a cyclist exerts on the pedal varies from a minimum to maximum. When does the cyclist exert maximum turning effort?

A. crank makes 90° with the foot push
B. crank makes 0° with the foot push
C. cyclist is climbing a hill
D. cyclist is turning a corner

Question 11:

Which of the following statements is true of a wedge used as a simple machine?

A. A very small force is required to lift a bog load.
B. Work done is always so much.
C. Effort on the wedge is applied vertically.
D. There is no frictional force.

Question 12:

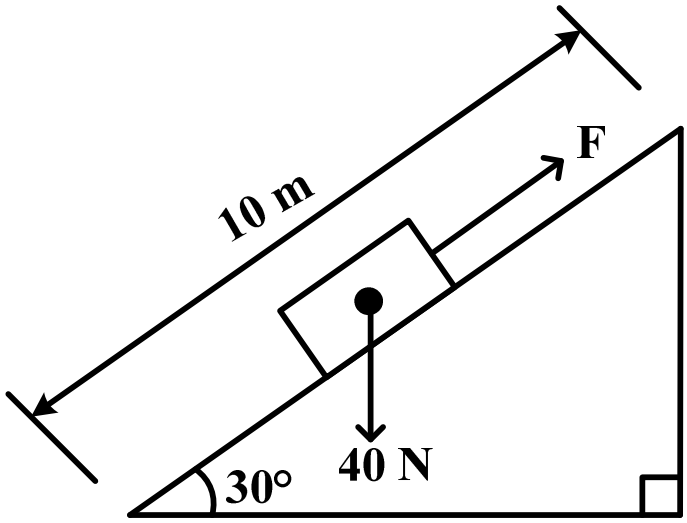


Fig. 5

A load of 40 N is pulled steadily from *A* to *B* along an inclined planed by a force *F* as shown in figure 5. Find the velocity ratio of the system.

A. 1.0.
B. 1.2.
C. 2.0.
D. 4.0.

Question 13:

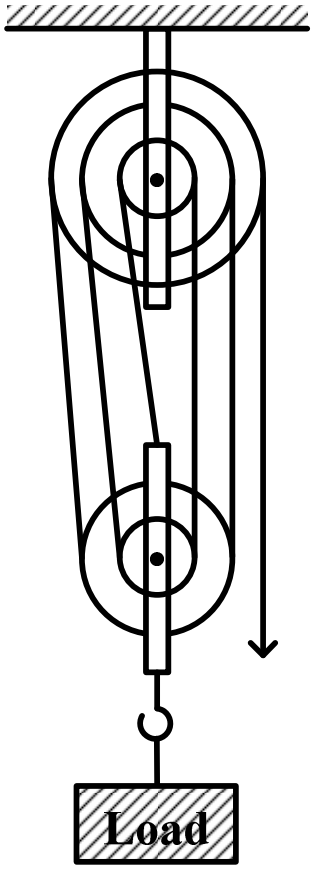


Fig. 8

The block and tackle pulley system in figure 8 has an efficiency of 80%. The load which can be lifted by an effort of 10 N is

A. 4 N
B. 8 N
C. 40 N
D. 50 N

Question 14:

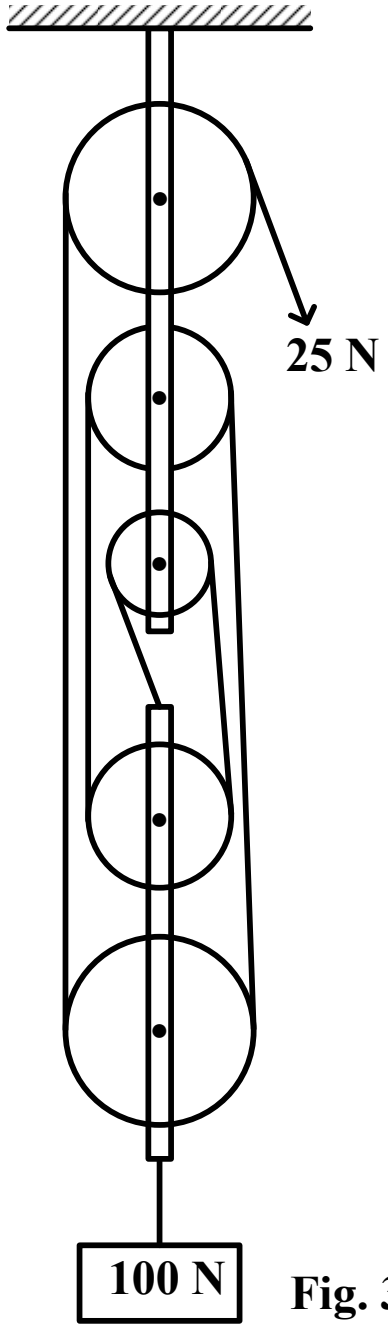


Fig. 3

The minimum force required to raise a load of 100 N is 25 N using the block and tackle system in figure 3. Calculate the efficiency of this block and tackle system

A. 50%
B. 75%
C. 80%
D. 100%

Question 15:

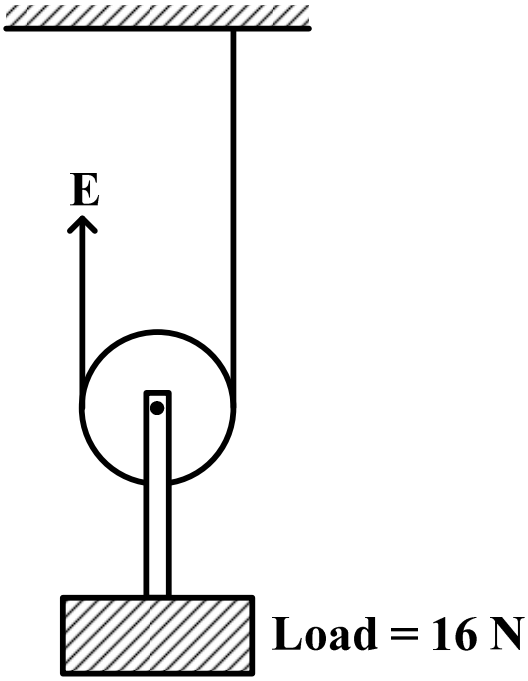


Fig. 9

Figure 9 shows a light, smooth pulley used to lift a load of 16 N with an effort E. The mechanical advantage of the system is

A. 128
B. 2
C. 1
D. $\frac{1}{2}$

Question 16:

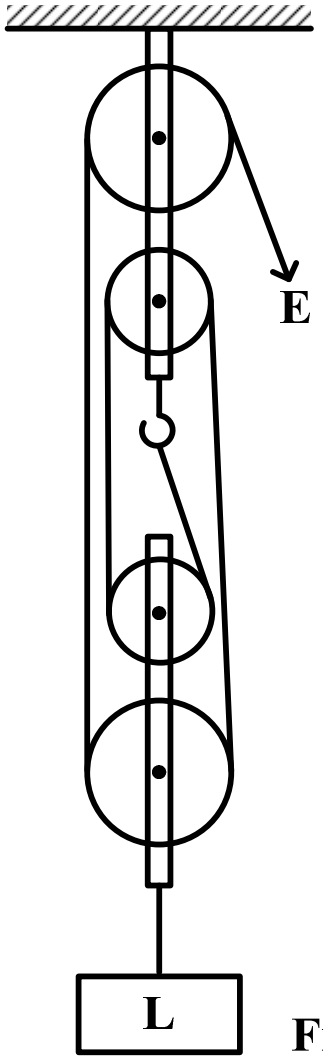


Fig. 4

Which of the following statements are true about the pulleys shown in figure 4?

(i). The mechanical advantage of the system increases up to a limit as the load increases.
(ii). The efficiency of the system is less than 100%.
(iii). The mechanical advantage may exceed 4 depending on the load.
(iv). The efficiency of the system will decrease as the load increases.

A. (i) and (ii)
B. (iii) and (iv)
C. (i), (ii) and (iii)
D. (ii), (iii) and (iv)

Question 17:

Find the efficiency of a machine which requires an effort of 200 N to raise a load of 18000 N if its velocity ratio is 300

A. 30%

B. 60%
C. 67%
D. 90%

SECTION B: (43 Marks)

Answer **all** *questions in this section. All working* **must** *be shown clearly in the spaces provided.*

Question 18:

(a). Define **Mechanical Advantage** of a machine. [1]

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(b). Figure **6** shows a load of 10 N being raised by a simple frictionless pulley system.

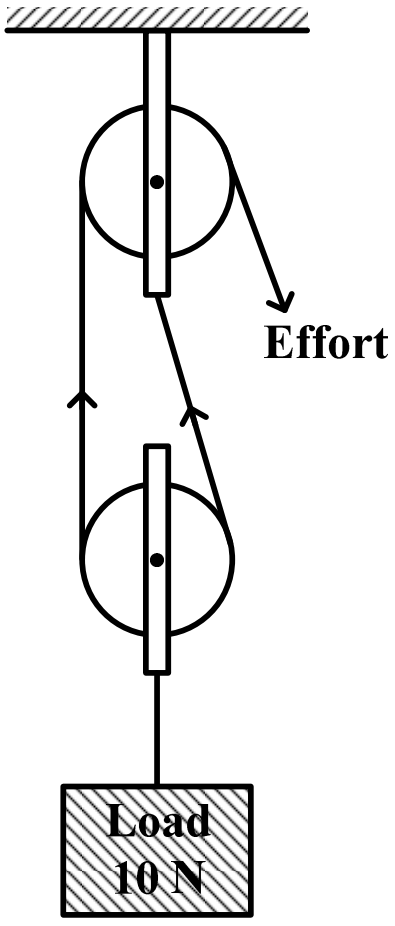

Fig. 6

(i). What is the **velocity ratio** of the system? [1]

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(ii). Calculate the effort required to lift the load if the mass of the pulley is 0.2 kg. [2]

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Question 19:

(a). What is meant by **efficiency** of a machine? [1]

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(b). An effort of 200 N is used to lift a load of 640 N using the pulley system in figure 12.

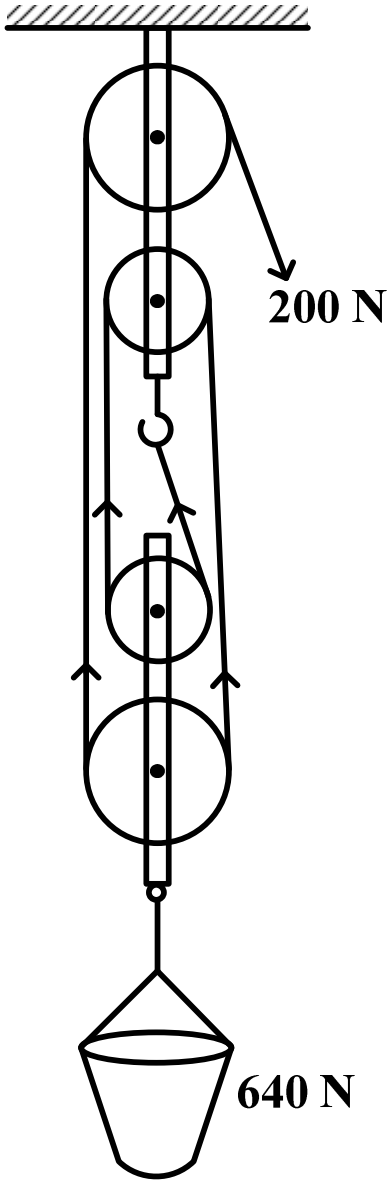

Fig. 12

Find the efficiency. [3]

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Question 20:
A block and tackle pulley system is used to raise a load of 400 N steadily through a height of 15 m. If the work done against friction is 1000 J, calculate the

(a). work input. [2]

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(b). efficiency of the system. [2]

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Question 21:

(a). Define the term **velocity ratio**. [1]

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(b). A wheel and axle machine has efficiency of 45%. If the radii of the wheel and axle are 20 mm and 2 mm respectively, find the:

(i). velocity ratio. [1]

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(ii). mechanical advantage. [2]

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Question 22:
Figure 10 shows a pulley system supporting a load of 600 N.

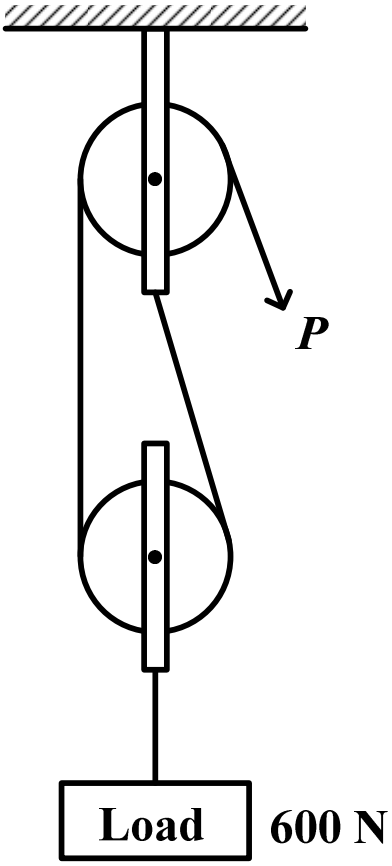

Fig. 10

Find the

(i). tension in the string. [2]

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(ii). value of ***P*** if the mechanical advantage is 3. [2]

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Question 23:

(a). What is meant by efficiency of a machine? [1]

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(b). Draw a single pulley system of velocity ratio 3. [2]

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(c). State one reason why the efficiency of a machine is always less than 100%. [1]
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Question 24:

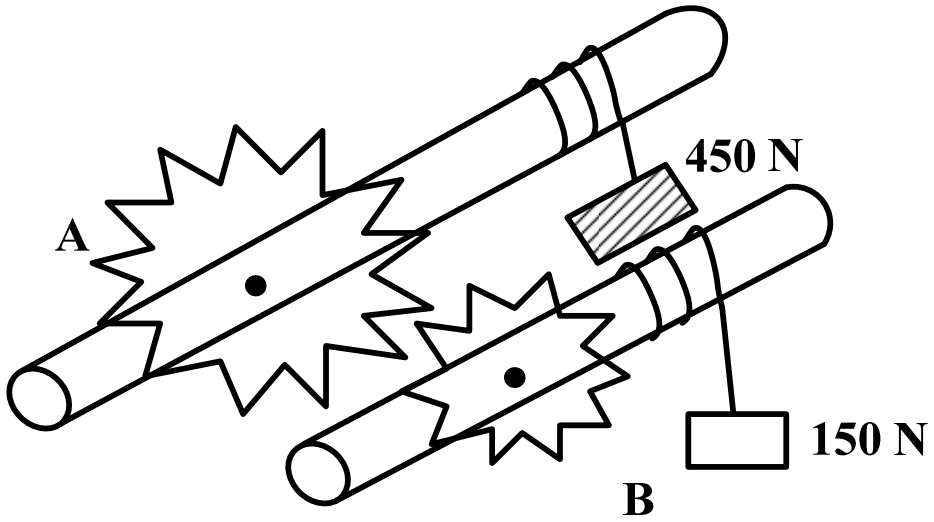

Fig. 8

Two gear wheels A and B with 80 and 20 teeth respectively lock into each other. They are fastened on axles of equal diameters such that a weight of 150 N attached to a string wound around one axle raises a load of 450 N attached to a string wound around the other axle as shown in figure 8.

(i). the velocity ratio. [2]
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(ii). the efficiency of the system. [2]
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Question 25:

(a). Draw a labelled diagram to illustrate the lever principle as applied to a wheelbarrow. [2]

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(b). the graph in the figure below shows the variation of the efficiency of a pulley system with load.

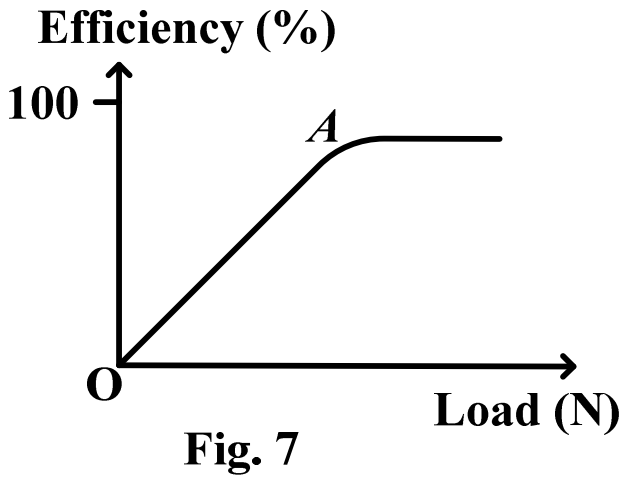

Fig. 7

Explain why

(i) Part OA of the graph is almost a straight line. [1]

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(ii) From A, the graph curves and finally levels off before reaching 100%. [2]

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Question 26:

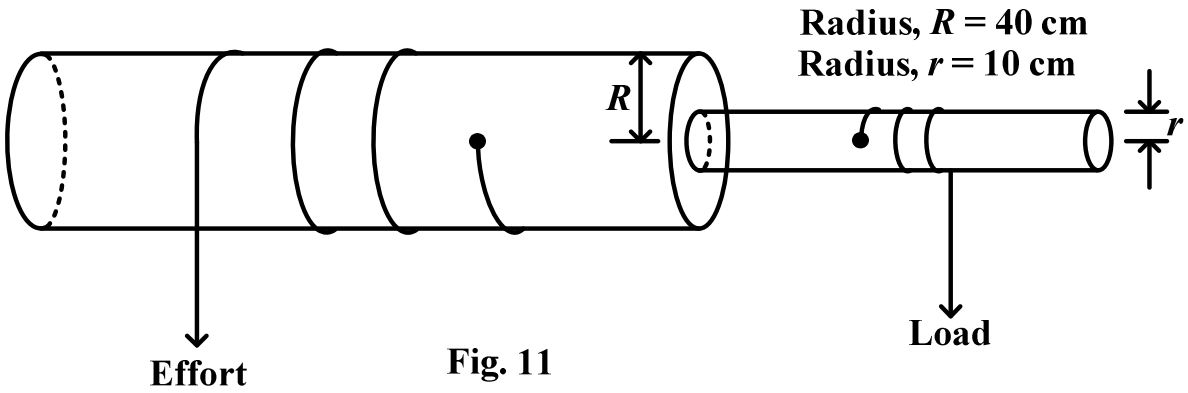

Fig. 11

The above figure shows a wheel and axle system. When an effort of 300 N is applied, a load of 900 N is raised through a distance of 1.0 m. Calculate:

(i). the velocity ratio. [2]

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(ii). the efficiency of the system. [3]

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Question 27:

(a). What is meant by a first class lever?

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(b). Give two examples of first class levers.

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(c). By means of a lever, an effort of 50 N moves a load of 200 N through 3 m. If the effort moves a distance of 16 m, calculate;

(i). the mechanical advantage

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(ii). the efficiency of the lever

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END

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