



MACHINES

INCLUDED IN THIS SECTION

- ✓ Multiple-Choice Questions (MCQs)
- ✓ Solutions
- 1. When a machine is used as a force multiplier, then
 - a) Effort > load
 - b) Effort < load

- c) Effort = load
- d) None of these
- 2. When a machine is used as a speed multiplier, then
 - a) Effort > load
 - b) Effort < load

- c) Effort = load
- d) None of these
- 3. Mechanical advantage of a machine is given by
 - a) Effort + Load

c) Effort × load

b) Load / Effort

d) None of these

- 4. For an ideal machine
 - a) Output energy = Input energy
 - b) Output energy > Input energy

- c) Output energy < Input energy
- d) None of these
- 5. The correct relationship between mechanical advantage (M.A), the velocity ratio (V.R) and the efficiency (η) is
 - a) M.A. = $\eta \times v.r$.

c) $\eta = M.A. \times V.R.$

b) V.R. = $\eta \times M.A$.

- d) None of these
- 6. A lever for which the Mechanical Advantage (MA) is less than 1 has the
 - a) Fulcrum at midpoint between the load and effort
 - b) Load between the effort and fulcrum





	c) Effort between the fulcrum and load					
	d) Load and effort acting at the same point					
7.	In class-II levers					
	a) $M.A = V.R$	c)	M.A >1			
	b) M.A > V.R	d)	M.A < 1			
8.	Pulley is a machine.					
	a) Simple	c)	Rotational			
	b) Complex	d)	None of these			
9.	A nut that can be broken by applying a for	rce of 40 H	Kgf is broken by placing a 20 cm			
	long nut cracker at a distance of 2 cm from the hinge. Calculate the minimum force					
	needed to break the nut?					
	a) 8 Kgf	(c)	6 Kgf			
	b) 5 Kgf	(b	4 Kgf			
	o, og-					
10	. A movable pulley is used as:		76			
	a) A speed multiplier	c)	An energy multiplier			
	b) A force multiplier	(d)	None of these			
		20				
11	. A single fixed pulley is used because	.0				
	a) its mechanical advantage > 1					
	b) its velocity ratio < 1					
	c) it gives 100% efficiency					
	d) it helps to apply the effort in a convenien	t direction				
12	. The mechanical advantage of an ideal pul	lley is:				
	a) 1	c)	Less than 2			
	b) 2	d)	Less than 1			
13	. The velocity ratio of a combination of n m		ulleys with a fixed pulley is			
	always 2n. Choose the appropriate option.	,				
	a) True	c)	Maybe			
	b) False	d)	Not sure			
1						
14	A woman draws water from a well using a	_	•			
water together is 6 kg. The Force applied by the woman is 670 N. The Mechani						
	Advantage will be					
	a) 1.85	b)	-1.16			





	c)	0.857	d)	2.16		
15.	A pulley system with velocity ratio 4 is used to lift a load of 150 kgf through a vertical height of 20 m. The effort required is 50 Kgf in the downward direction. Calculate the distance moved by the effort.					
		40 m	c)	160 m		
		80 m		800 m		
4.	T) 6%	N				
16.		ficiency of a machine is:				
	-	output + input		output / input		
	b)	output – input	d)	output × input		
17.		ficiency of a machine is:		M, M ,		
	a)	M.A./V.R.	c)	$M.A. \times V.R.$		
	b)	V.R./M.A.	d)	None of these		
18.	18. Mechanical Advantage (M.A), Load (L) and Effort (E) are related as:					
	a)	$M.A. = \times E$	c)	$E = M.A. \times L$		
	b)	$M.A \times E = L$	d)	None of these		
		x Ox				
19.	W	hich of the following statements is not true for	a 1	nachine:		
	a) It always has efficiency less than 100%,					
	b) Its mechanical advantage can be less than 1.					
	c)	It can also be used as a speed multiplier.				
	d) It can have a mechanical advantage greater than the velocity ratio.					
20. A crowbar of length 120 cm has its fulcrum situated at a distance of 20 cm from the						
	load. Calculate the mechanical advantage of the crowbar.					
	a)		c)			
	b)		d)			
	-,		-)			
21. A pair of scissors has its blades 15 cm long, while its handles are 7.5 cm long. What is						
	mechanical advantage?					
		0.55	c)	0.5		
		0.15		0.4		
	٠,		٠,			
22.	22. A force of 5 kgf is required to cut a metal sheet. The shears used for cutting the metal					

sheet has 5m long blades, while its handle is 10cm long. What effort is needed to cut the

b) 3.5 Kgf

sheet?a) 2.5 Kgf





c) 1.5 Kgf

- d) 0.5 Kgf
- 23. The mechanical advantage of an ideal single movable pulley is:
 - a) 1

c) less than 2

b) 2

- d) less than 1
- 24. In a block and tackle system consisting of 3 pulleys, a load of 75 kgf is raised with an effort of 25 kgf.

Find: (i) the Mechanical Advantage, (ii) Velocity Ratio and (iii) Efficiency.

a) MA=3, VR=1, E=1

c) MA=3, VR=3, E=1

b) MA=1, VR=3, E=1

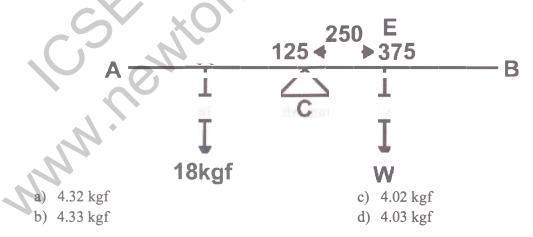
- d) MA=1, VR=3, E=3
- 25. A pulley system has three pulleys. A load of 240N is overcome by applying an effort of 100N. Calculate the mechanical advantage and efficiency of this system.
 - a) MA=2.4,VR=80%

c) MA=2.4,VR=90%

b) MA=2.5,VR=80%

d) MA=2.4, VR=85%

- 26. In an ideal machine,
 - a) the power input is equal to the power output of the device
 - b) the power input is more to the power output of the device
 - c) the power input is less than the power output of the device
 - d) none of the above
- 27. A 4 m long rod of negligible weight is to be balanced about a point 125 cm from its one end. A load of 18 kgf is suspended at a point 60 cm from the support on the shorter arm. A weight W is placed 250 cm from the support on the longer arm. Find W.



28. The relationship between M.A. and V.R. for an ideal machine is





- a) M.A. = V.R.
- b) M.A. < V.R.

- c) M.A. > V.R.
- d) $M.A. \leq V.R.$
- 29. The relationship between M.A. and V.R. for a practical machine is
 - a) M.A. = V.R.

c) M.A. > V.R.

b) M.A. < V.R.

- d) $M.A. \leq V.R.$
- 30. A simple machine that can be used to multiply force.
 - a) Nutcracker

c) Both a & b

b) Single fixed pulley

- d) None of the above
- 31. A simple machine that can be used to change the direction of force applied
 - a) Nutcracker

c) Both

b) Single fixed pulley

- d) None of these
- 32. What is the main energy transformation that occurs in charging a battery?
 - a) Electrical energy to chemical energy.
- c) Chemical energy to light energy
- b) Electrical energy to heat energy.
- d) Light energy to chemical energy
- 33. A pulley system with V.R. = 4 is used to lift a load of 175 kgf through a vertical height of 15 m. The effort required is 50 kgf in the downward direction. (g = 10 N/kg) Calculate:
 - 1. Distance moved by the effort
 - **2.** Work done by the effort
 - 3. M.A. of the pulley system
 - 4. Efficiency of the pulley system
 - a) $d_E = 60 \text{ m}$
- W=30,000 J
- M.A.=3.5
- E=87.5%

- b) $d_E = 50 \text{ m}$
- W=30,000 J M.A.=3.5
- E=87.5%

- c) $d_E = 60 \text{ m}$
- W=40,000 J M.A.=3.5
- E=87.5%

- d) $d_E = 60 \text{ m}$
- W=30,000 J M.A.=4.5
- E=87.5%
- 34. Aditya exerts a pull of 150 gf. What is the maximum load he can raise with this pulley system if its efficiency = 75%? (Assume VR = 5)
 - a) 563.5kgf

c) 564.5 kgf

b) 562.5kgf

d) 565.5 kgf

- 35. In a pulley system
 - a) The ideal mechanical advantage is equal to the number of rope segments.
 - b) The ideal mechanical advantage is more than the number of rope segments.





- c) The ideal mechanical advantage is less than the number of rope segments.
- d) There is no relation between mechanical advantage and number of rope segments.

36. The velocity ratio of a single movable pulley is

a) 2

c) > 2

b) < 2

d) 1

37. In a ceiling fan

- a) Electrical energy changes to mechanical energy.
- b) Electrical energy changes to chemical energy.
- c) Electrical energy changes to heat energy.
- d) Chemical energy changes to light energy.

38. Velocity ratio of a single movable pulley is

a) 1

b) 2

c) 3

d) 4

39. In a single movable pulley, if the effort moves by a distance x upwards, by what height is the load raised?

- a) The load is raised to a height of x/2
- b) The load is raised to a height of x/3
- c) The load is raised to a height of 2x
- d) The load is raised to a height of 2/x

40. A pulley system has a velocity ratio of 4 and efficiency 90%. Choose a correction option to indicate

- i. The mechanical advantage of the system
- ii. The effort required to raise a load of 300 N by this system

a) M.A.=3.6 E=83.33

c) M.A.=3.4 E=83.33

b) M.A.=3.6 E=82.33

d) M.A.=3.4 E=82.33

41. Name a machine which is used to multiply speed

a) movable pulley

c) single fixed pulley

b) gear system or class III lever

d) all of the above

42. Name a machine which is used to change the direction for force applied

a) movable pulley

c) single fixed pulley

b) gear system or class III lever

d) all of the above





43. The velocity ratio of a combination of <i>n</i> movable pulleys with a fixed pulley is always						
a) 2n	c) n^2					
b) n	d) 2 ⁿ					
44. The velocity vetic of a black and tackle system	so almono a small to the mumb on of atmost					
44. The velocity ratio of a block and tackle system is always equal to the number of strands						
of the tackle supporting the load. Choose an ap						
a) True	c) It may or may not					
b) False	d) None of the above					
45. A Single fixed pulley is used because it:						
a) has a mechanical advantage greater than 1.						
b) has a velocity ratio less than 1	1, 21.					
c) gives 100% efficiency						
d) helps to apply the effort in a convenient directi	on.					
46. The mechanical advantage of an ideal single m	ovable pulley is:					
a) 1	c) less than 2					
b) 2	d) less than 1					
	0.0					
47. A Woman draws water from a well using a fix						
together is 6 kg. The force applied by woman i	s 70 N. The mechanical advantage is					
$(Take g = 10 ms^{-2})$						
a) 0.858	c) 0.867					
b) 0.857	d) 0.886					
48. The efficiency of a single movable pulley system is not 100% because						
a) The friction of the pulley bearing is not zero.						
b) The weight of the pulley and string is not zero.						
c) Both a and b						
d) None of these						
40. A local of 100 has falling through 0 m in 4 accord	de deixes e consideration de la consideration					
49. A load of 100 kg falling through 8 m in 4 seconds, drives a machine whose efficiency is						
0.75. Calculate the input and output powers of the a) 1960 W,1470 W	c) 1987 W,1471 W					
b) 1966 W,1470 W	d) 1988 W ,1462 W					
b) 1900 W,1470 W	d) 1988 W ,1402 W					
50. A combination of a movable pulley P ₁ with a fixed pulley P ₂ is used for lifting up a load						
of 20 kgf. The effort applied at the free end of the string, neglecting the weight of the						
pulley P1 and friction is						
a) 9.8 N	c) 98 kgf					
b) 08 N	d) 10 N					