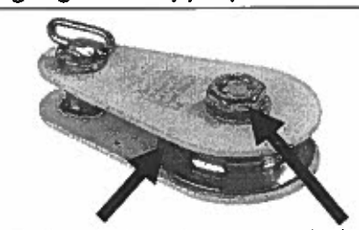
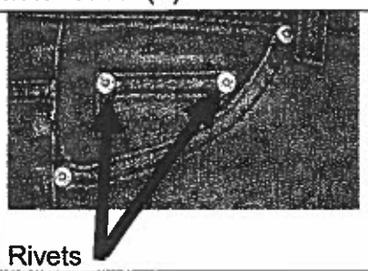
Ch 13 Mechanical Engineering

Name: Answers

1. Circle or highlight the appropriate link characteristics. (8)

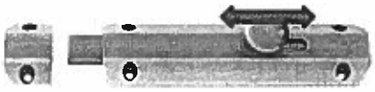
0.5 each

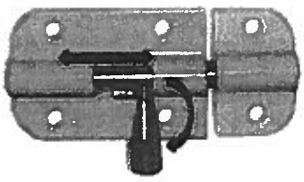


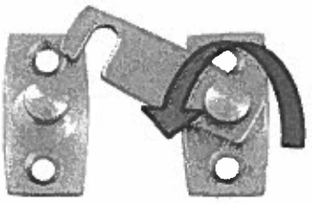


Pulley & bracket		Jean pocket & jean	
Direct	Indirect	Direct	Indirect
Rigid	Flexible	Rigid	Flexible
Removable	Non-removable	Removable	Non-removable
Complete	Partial	Complete	Partial

2. Indicate the degree(s) of freedom of:(3)





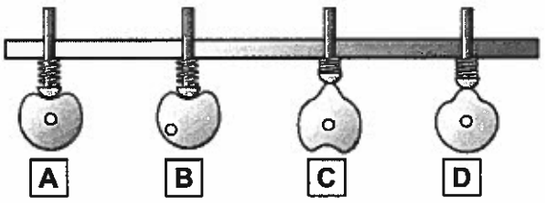


a) Tx

b) Tx Rx

c) Rz

3. Consider this cam and follower system. (4)



a) Which system involves an eccentric cam? B

b) What type of guiding does the spring ensure? Translational

c) What degrees of freedom does this system have? Ty Rz

d) In which system will the rod rise the highest? B

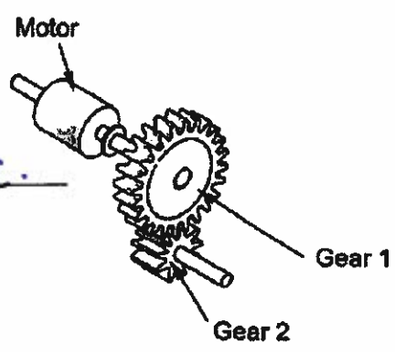
4. You are attempting to move a very heavy cabinet that is on casters (wheels). How would the following measures change the amount of friction between the cabinet and floor? (4)

	Circle your answer		
Decreasing the mass of the cabinet by removing items.	Increase	Decrease	No effect
Adding another set of wheels.	Increase	Decrease	No effect
Replacing the wheels with soft rubber wheels.	Increase	Decrease	No effect
Cleaning the floor in the room where you are moving it.	Increase	Decrease	No effect

5. Consider the gear assembly in the diagram. (2)

a) Which gear is the driver? 1

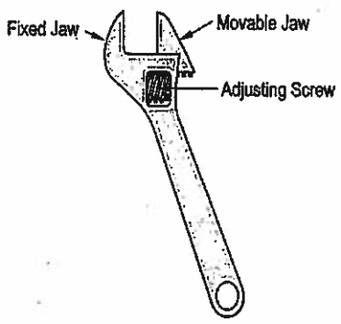
b) Does this gear assembly increase or decrease the speed? inc.



__/21

Answer the multiple choice questions in the table at the bottom of the page.(2 marks each)

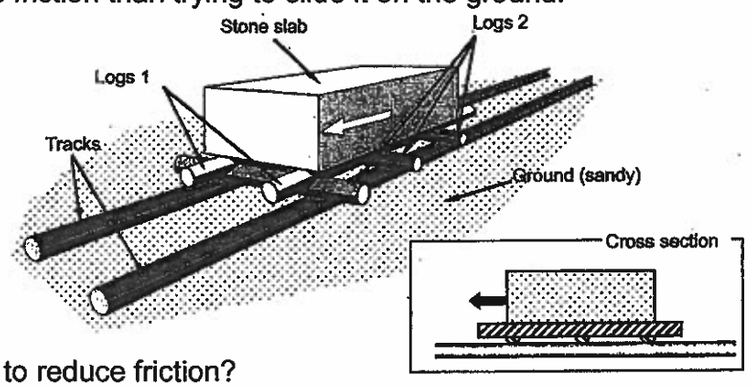
6. The tool to the right is an adjustable wrench that is used to tighten nuts of different sizes. The only way to open or close the jaws is by rotating the "adjusting screw".
Which of the following apply to this system?



1. It involves motion transformation.
2. It involves motion transmission.
3. It is reversible.
4. It is not reversible.

A) 1 & 3 B) 1 & 4 C) 2 & 3 D) 2 & 4

7.To slide a heavy stone slab you can use the system below. It is a set of wooden track that allows you to move it more efficiently and with less friction than trying to slide it on the ground.

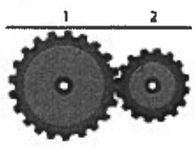


Where should a lubricant be applied to reduce friction?

A) between the stone and logs 1 C) between logs 2 and the tracks

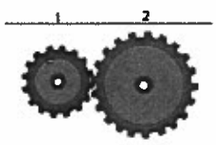
B) between logs 1 and logs 2 D) between the tracks and the ground

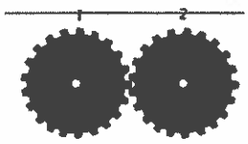
8.. In which system shown below does gear #2 turn **SLOWER** than gear #1?

A) 

B) 

Same

C) 

D) 

Same

9. Which cam below would not allow both clockwise and counter-clockwise motion?

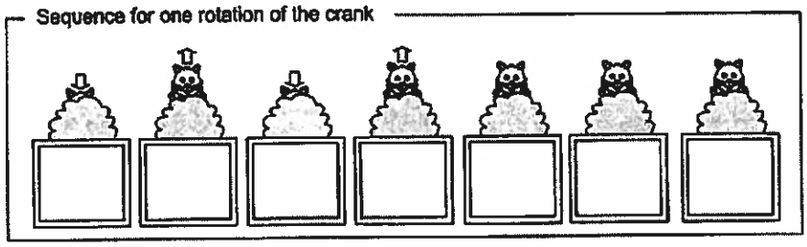
A) 

B) 

C) 

D) 

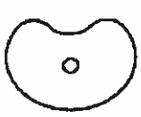
10. The toy below is a box containing a cam that can move a plush cat in and out of the box through the rotation of a crank.

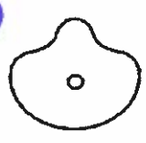


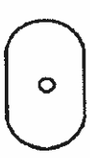
The toy designers wants the cat to move in and out of the box **twice** with each rotation of the crank and to **remain out longer the second time**.

Which of the following cams will make the toy move this way?

A) 

B) 

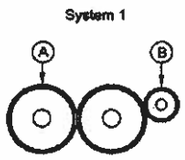
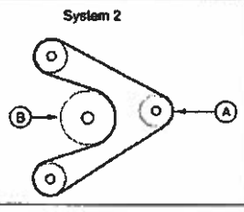
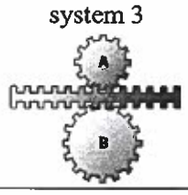
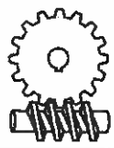
C) 

D) 

Question #	6	7	8	9	10
Answer	B	B/C	C	D	C

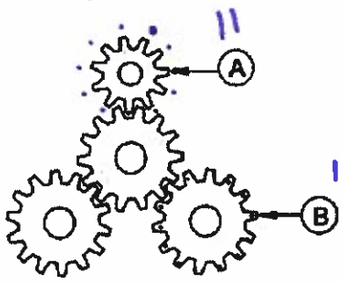
__/10

11. Fill-in the table. (6)

Picture	Name the system	Is it reversible? Yes or no.	Motion transmission or transformation?
System 1 	Friction gear	y	transmission
System 2 	Belt + pulley	y	transmission
system 3 	Rack + pinion	y	transformation
	worm + worm gear	N	transmission.

12. If gear A is the driver and is rotating at 70 rpm clockwise. How fast and in which direction is B rotating? (2)

Please show your work!



$\frac{\text{driver}}{\text{driven}} = \frac{11}{14} = 0.786$

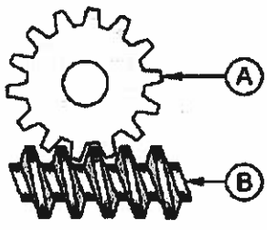
$0.786 \times 70 =$

Speed 55 rpm

Circle (clockwise) or counter-clockwise

13. If the worm is rotating at 160 rpm, how fast is the gear rotating? Show your work please. (2)

16 teeth



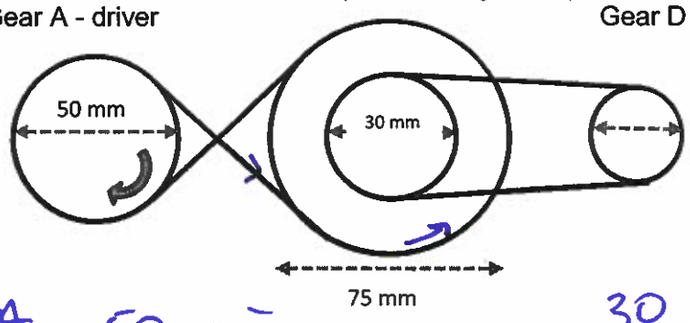
$\frac{1}{16} \times 160 = 10$ rpm

14. Determine the speed & direction of gears B, C and D. Show your work. (4)

Gear B & C (C is the larger one)

Gear A - driver

Gear D



Gear A = 100 rpm & clockwise

Gear B = 67 rpm & CC

Gear C = 67 rpm & CC

Gear D = 100 rpm & CC

$\frac{A}{B} = \frac{50}{75} = 0.\bar{6}$

$0.\bar{6} \times 100 = 67$

$\frac{30}{20} = 1.5$

$1.5 \times 66.\bar{6} = 100$

/14