

Department of Electrical Engineering

Assignment

Date: 20/04/2020

Course Details

Course Title:	<u>Basic Mechanical Technology</u>	Module:	<u>2nd</u>
Instructor:	<u>Sir Sajid Nawaz</u>	Total Marks:	<u>30</u>

Student Details

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Q1	(a)	A body of mass 1 kg undergoes a change of velocity of 4m/s, what is the force acting on it?	(10 marks)
	(b)	A force of 1200 N acts on the surface of area 10 cm ² normally. What would be the thrust and pressure on the surface?	
Q2	(a)	Define Equilibrium and its conditions.	(10 marks)
	(b)	Differentiate between stable and unstable Equilibrium and give proper examples you will Observe in daily life.	
Q3	(a)	Define the following terms and give daily life example. <ul style="list-style-type: none"> • Force • Gravity force • Friction force • Spring force • Tension force 	(10 marks)

Question 1) (a) A body of mass 1 kg undergoes a change of velocity of 4m/s. what is the force acting on it?

Solution)

Acceleration is given by $a = \text{change in velocity} / \text{Time taken}$

So $a = 1 \text{ m/s}^2$

Now force is given by

$$F = ma$$

$$F = 1 \text{ N}$$

Or

$$1\text{kg} \cdot 4\text{ms} = 4\text{N} \quad \textbf{ANS}$$

Question 1) (b) A force of 1200 N acts on the surface of area 10 cm² normally. What would be the thrust and pressure on the surface?

Given:

$$\text{Force } F = 1200 \text{ N, Area } A = 10 \text{ cm}^2 = 10 \times 10^{-4} \text{ m}^2 = 10^{-3} \text{ m}^2$$

$$\text{Thrust} = \text{Normal pressure} = F = 1200 \text{ N}$$

$$\begin{aligned} \text{Pressure } P &= F/A \quad 1200\text{N} / 10^{-3}\text{m}^2 \\ &= 1.2 \times 10^6 \text{ N/m}^2 \end{aligned}$$

Q3, Define the following terms and give daily life example.**Ans****Force**

Force is an agent which move or try to move and stop or try to stop a moving body is called force

E.g.

Push a chair or try to stop a moving car

Gravity force

That fore in which the earth attract everything towards its self is called gravity force

E.g.

A ball throwing to the air and after some displacement the ball will fall on the earth due to gravity

Spring force

The spring force is the force exerted by a compressed or stretched spring upon any object that is attached to it. An object that compresses or stretches a spring is always acted upon by a force that restores the object to its rest or equilibrium position

E.g.

To pull or push a spring

Friction force

Friction force is a force in which the force exerted by a surface as an object moves across it or makes an effort to move across it. There are at least two types of friction force - sliding and static friction. Though it is not always the case, the friction force often opposes the motion of an object

For example,

If a book slides across the surface of a desk, then the desk exerts a friction force in the opposite direction of its motion.

Tension force

The tension force is the force that is transmitted through a string, rope, cable or wire when it is pulled tight by forces acting from opposite ends. The tension force is directed along the length of the wire and pulls equally on the objects on the opposite ends of the wire.

Q2 (a) Define Equilibrium and its conditions.**Ans**

A state in which opposing forces or influences are balanced.

First Condition

The first condition of equilibrium is that the net force in all directions must be zero

- There are two conditions that must be met for an object to be in equilibrium.
- The first condition is that the net force on the object must be zero for the object to be in equilibrium.
- If net force is zero, then net force along any direction is zero.

Second Condition

The second condition of static equilibrium says that the net torque acting on the object must be zero

- The second condition necessary to achieve equilibrium involves avoiding accelerated rotation.
- A rotating body or system can be in equilibrium if its rate of rotation is constant and remains unchanged by the forces acting on it.
- The magnitude of torque about a axis of rotation is defined to be $\tau = rF\sin\theta$

Q2 (b) Differentiate between stable and unstable Equilibrium and give proper examples you will Observe in daily life.**Ans****Stable equilibrium**

A state in which a body tends to return to its original position after being disturbed.

Examples of stable equilibrium are bodies lying on the floor such as chair, table etc.

Unstable equilibrium

A state of equilibrium in which a small disturbance will produce a large change.

Example is a ball resting on top of a hill