IQRA NATIONAL UNIVERSITY
PESHAWAR

B.tech civil

BATCH 2015

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I.D 12430

PAPER Applied Mechanic

Mid term

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Question No 1

PART "A"

Applied Mechanics.

Mechanics:-

The branch of Science which deals with the force and their effect on the bodies on which they act called mechanic.

⇒ Applied mechanics also know as engineering mechanics is the branch of engineering which deal with the law of mechanics is applied to solution of engineering problem

BRANCH OF APPLIED MECHANICS:-

The subject of applied mechanics is broadly divided into the following two branches:

1- Statics
2- Dynamics:-

Statics:-

The branch of applied mechanics which deals with the force and their effect which acting upon a bodies which are at rest is called statics.

Dyanamics:-

The branche of applied mechanich which deals with the force and their effect while acting upon abadies which are motion is called dyanamic.

Dyanamic

It is further divided into two types

1- Kinetics
2- Kinematics:-

1:- Kinetics:-

The branch of dyanmics which deals which the deals the relationship b/w motion of bodies and force causing motion is called kinetics.

Kinematics:-

The branch of dyanmics which deals with the motion bodies ~~whi~~ without considering the force which causing motion is called kimentic

Question NO 1

PART "B"

System of unit

There are four system of unit recognized universally.

C.G.S system:-

In this system the unit length mass and time are centimeter gram and second respectively.

F.P.S system:-

In this system unit of length mass and time are foot pound and second respectively.

M.K.S system:-

In this system

The unit length mass and time are meter Kilogram and second respectivity.

S.I systems:-

In this system the unit length mass and time are meter (m) Kilogram (kg) and second(s) respectively the S.I units of various derived units are under.

BASICS QUANTITIES

The four basic quantios in mehanic are.

→ length
→ Mass
→ Time
→ Fource

Length:- is used to locate the postion of point and describe the size physical system.

Mass:- It a meaure of quauttty of matter.

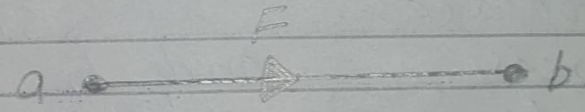
Time:- is a Sucsessiòn of evonts It is importanet in "paganic

Question No 2

PART "A"

FORCE :-

A Force (F) is a vector quantity which is represented graphically by straight line say "ab" whose length is proportional of the magnitude of force and the arrow show the direction of force ab show in Figure. unit of force in Newton (N)



EFFFCT OF A FORCE

A force acting on body may have the following effect on the body

* It may change the state of rest of uniform motion of body.

* :- It may change the direction of motion of moving body.

* It may change the shape internal stress in the body.

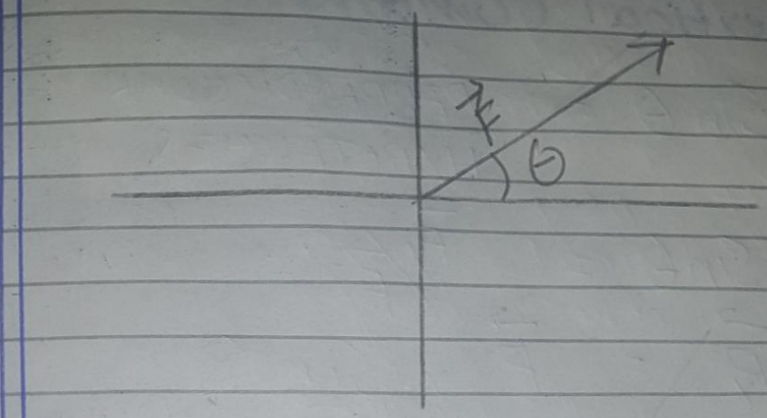
* It may produce internal stress in the body.

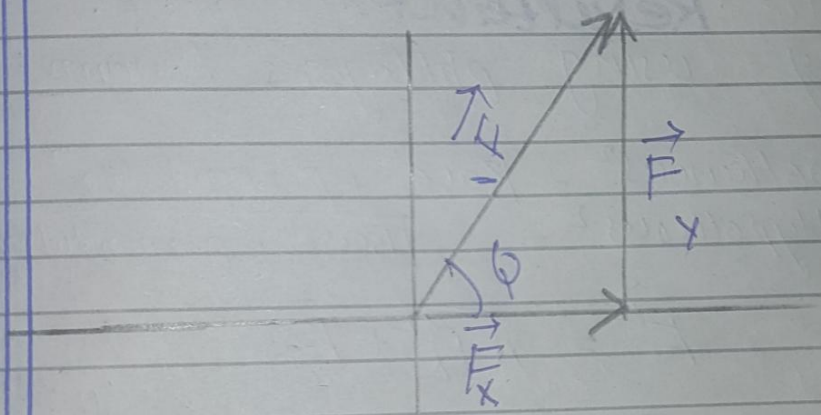
PART "B"

RESOLUTION OF FORCE

Any Foure $\vec{F}$ acting in direction ⊖ above the horizontal can be replaced by two forces $\vec{F_x}$ and $\vec{F_y}$ which act at the right angle to each other $\vec{F_x}$ is the horizontal Component and $\vec{F_y}$ is the vertical Component.

the two force of or to add vertically makes $\vec{F}$ (resultant)





HORIZONTAL Component.

$$\cos\theta = \frac{\text{Base}}{\text{HYPOTENUSE}}$$

$$\cos\theta = \frac{\vec{F}_x}{\vec{F}} = \vec{F}$$

$$\vec{F}_x = \vec{F} \times \cos\theta$$

vertical Component.

$$\sin\theta = \frac{\text{PERPENDICULAR}}{\text{HYPOTENUES}}$$

$$\sin\theta = \vec{F_y} / \vec{F}$$

$$\vec{F_x} = \vec{F} \times \sin\varphi$$

Resultant.

By using phthagors theorm

$$\text{Hypothenous}^2 = \text{Base}^2 + \text{perpendular}^2$$

$$\text{Hypothenous}^2 = \sqrt{\text{Base}^2 + \text{perpendular}^2}$$

$$\vec{F} = \sqrt{\vec{F_x}^2 + \vec{F_x}^2}$$

Direction

$$\tan\varphi = \text{perpendular} / \text{Base}$$

$$\tan\varphi = \vec{F_y} / \vec{F_x}$$

$$\varphi = \tan^{-1}\left(\vec{F_x} / \vec{F_x}\right)$$

Question No 3

PART "A"

Fundamental Law of Mechanic

* Newton's First Law
* Newtons's second Law
* Newtons's third law
* Newton's law of gravitation
* Law of transimibility of Force
* parallelogram law of Force

Newtones First Law.

→ It states that every body continous in it state of rest of uniform motion in stright line unless is compelled by external agency acting on it.

→ Newton's law of motion of rotation which state that "Every body continues in its state of rest or of uniform motion of rotation about an axis unless it is acted upon by some external fouqce.

Newtons 2nd law

It state that the rate of change of momentum

of body is directly proportional to the impressed force and takes place in the direction of the force acting on it.

Force of rate chang momentum

Momentum = Mass x velocity

As mass do not chang

Force α Mass x rate of chang velocity

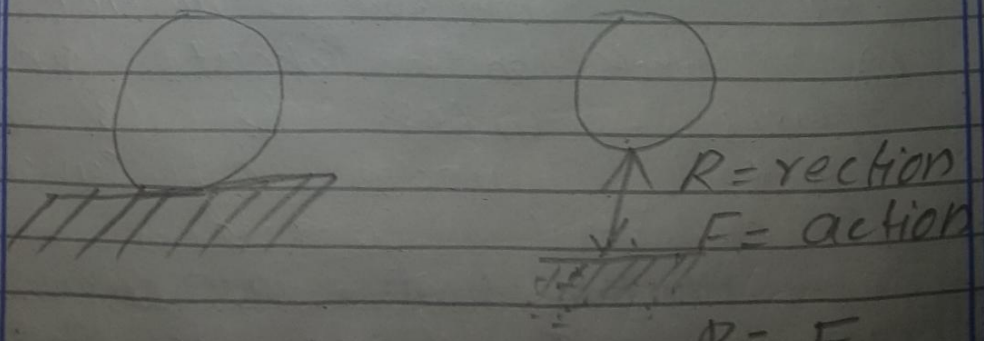
Force α Mass x accelaration

F α ma

F = ma

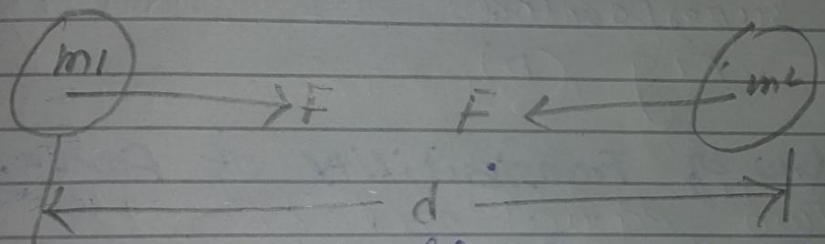
Newton's 3rd Law

It states that fore very fore in equal and opposit reaction.



Newtonis law of gravitation

Everybody attracts the other body. The force of attraction b/w any two bodies is directly proportional to their masses and inversely proportional to the sqare of the ~~distance~~ distance b/w them.



where G is the constant of proportionality it is know as Constant of gravitation Experimentally it is proved that the value of

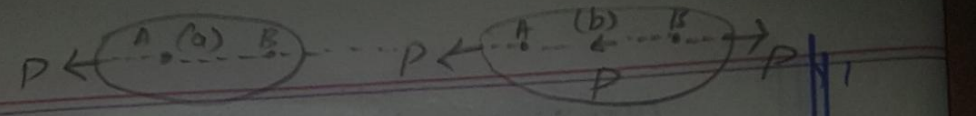
$$G = 6.673 \times 10^{-11} Nm^2/kg^2$$

$$F = G m_1 m_2 / d^2$$

law of transmissibility of Force

Statement:-

The point of application of force may be transitted along its line of action without changing it effect on the rigid body to which the force is applied.

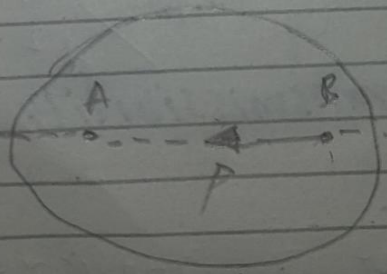


explonation:-

A force is acting at point A long line of action AB or rigid body as show in Fig (a) Two equal and opposit force of magnitude 'P' are added at point "B" along line of action AB according to law of superposition as show in Fig (b)

law of Transissibility of Force.

Two equal and opposite Force of magnitude 'P' at point A and B can be subtracted without changing action of original force P according to the law of superposition as shown in Fig (c).



(c)

thus the point of application of force P is transfered along its line of action from A to B.

Question NO 3

PART "B"

Moment:-

The turning effect caused by force on the body is called as a moment of force.

Def:-

The moment of force (M) is equal to the magnitude of the force (F) multiplied by the perpendicular distance (d) b/w the line of action of the force and axis of rotation

Moment = Force x perpendicular

M = F x d

Moment represent gemetrically.

- As show in fig below AB represent force F and O is the point about which the moment of.

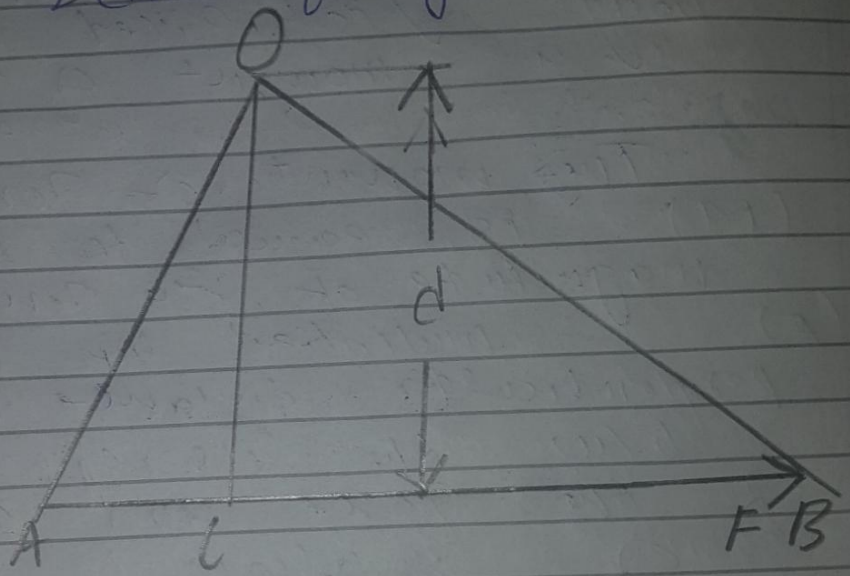
→ Force M is taken Let OC be perpendicular distance "d"

$M = F \times d$

$M = AB \times OC$

$M = 2 \times (\frac{1}{2} AB \times OC)$

$M = 2$ (Area of triangle OAB)



Thus Moment of Force about any point is geometrically equal to twice the area of the triangle having base representing a force and apex about which moment is taken.