M.A.L.D.GOVT. DEGREE COLLEGE GADWAL.

Affiliated toPalamuru University, Mahabubnagar.

Department of PHYSICS

STUDENT STUDY PROJECT ON

COMPOUDND PENDULUM

2016-17

M.A.L.D.GOVT. DEGREE COLLEGE GADWAL.

Affiliated toPalamuru University, Mahabubnagar.

Department of PHYSICS

PROJECT WORK ON

COMPOUDND PENDULUM

DONE BY

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UNDER THE GUIDANCE OF

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PHYSICS PROJECT WORK

compound pendulum

compound pendulum defination

Any rigid body which is making oscillations through a point in it afout a horizontally vector plane is called compound pendulum.

Explanation :-

Using simple pendulum the gravitational acceration of the place can be determined easily but due to errors in the experiment, accurate value of g can not be determined, They are.

1) The system of metallic bob together with the thread can not be treated as a point mass.

2) The motion of metallic bob is not completely linear, the bob will have ratational motion in addition to the vibrational motion.

3) Due to frictional force of air and buoyancy forces on the bob the energy

dissapation occurs.

Therefore g-value can not be determined correctly using simple compound pendulum. By making correction to the above occurs, the compound pendulum is used to determine the g-value.

Any rigid body which is making oscillations through a point in it about a horizontally vertical plane is called as compound pendulum.

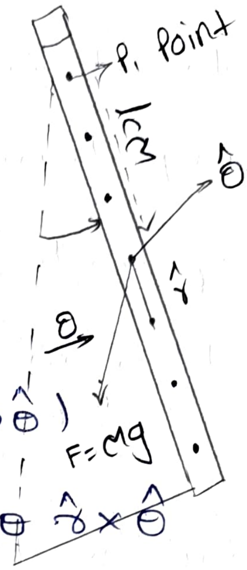
A body is hanged about a point 'o' of pendulum 'l' is the distance between centre of gravity and point of suspension when the pendulum displaced by small angle from its mean position. It will make oscillation at an angular displacement of 'θ' torque acting on the oscillator is $\vec{\tau} = -mg \times l \sin\theta$

Theory :-

$F_H = mg\cos\theta\,\hat{r}$

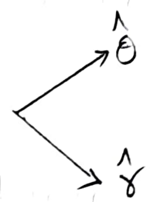
$F_V = mg\sin\theta\,\hat{\theta}$

$F = mg\cos\theta\,\hat{r} - mg\sin\theta\,\hat{\theta}$



$\tau = \hat{r} \times \vec{F}$

$= l\hat{r} \times (mg\cos\theta\,\hat{r} - mg\sin\theta\,\hat{\theta})$



$= mgl\cos\theta\,\hat{r}\times\hat{r} - mgl\sin\theta\,\hat{r}\times\hat{\theta}$

$\tau = -mgl\sin\theta$

Linear motion		Circular motion
Mass 'm'	$\longrightarrow$	Momentum of Inertia - I_0
displacement 's'	$\longrightarrow$	Angular displacement - θ
Velocity "v"	$\longrightarrow$	Angular Velocity - ω
acceleration "a"	$\longrightarrow$	Angular acceleration - α
Force "F"	$\longrightarrow$	Torque - τ

$(\tau = I_0\alpha)$

$\tau = -mgl_{cm}\sin\theta$

$\tau = I_0\alpha$

$I_0\alpha = -mgl_{cm}\sin\theta$

$I_0\dfrac{d^2\theta}{dt^2} = -mgl_{cm}\sin\theta$

$I_0\dfrac{d^2\theta}{dt^2} + mgl_{cm}\sin\theta = 0$

$$\frac{d^2\theta}{dt^2} + \frac{mgl_{cm}\theta}{I_o} = 0$$ [∵ $\sin\theta = \theta$, In this $\sin\theta$ is very small]

above Eqⁿ is comparing with

$$\frac{d^2\theta}{dt^2} + \omega^2\theta = 0$$

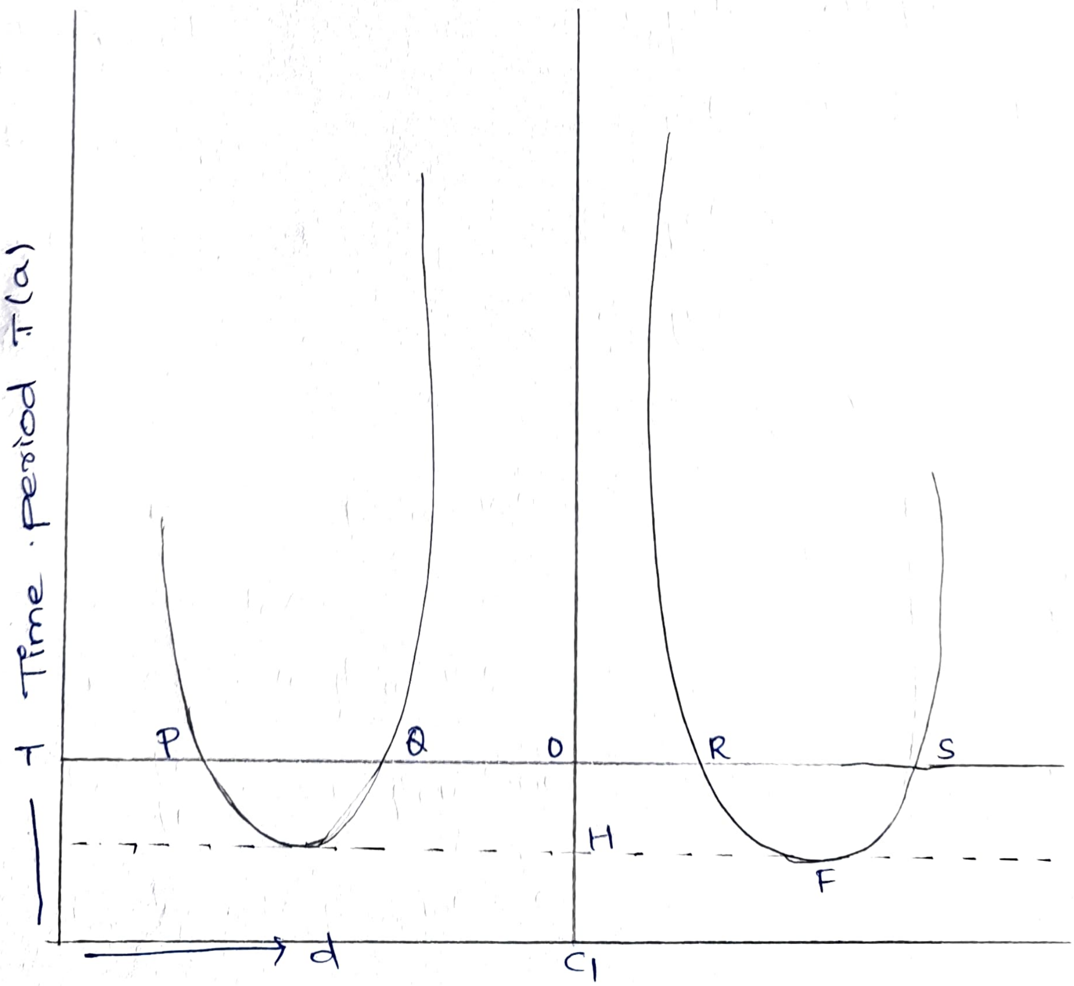
$$\omega = \sqrt{\frac{mgl_{cm}}{I_o}}$$

Timeperiod $T = \frac{2\pi}{\omega}$

from parallel axis theorem

$$T = I_{cm} + ml_{cm}^2$$

$$T = 2\pi\sqrt{\frac{I_c + ml_{cm}^2}{mgl_{cm}}}$$



$$T_1 = 2\pi \sqrt{\frac{I_{cm} + ml_1^2}{mgl_1}}$$

$$T_2 = 2\pi \sqrt{\frac{I_{cm} + ml_2^2}{mgl_2}}$$

$T_1 = T_2$

$$2\pi \sqrt{\frac{I_{cm} + ml_1^2}{mgl_1}} = 2\pi \sqrt{\frac{I_{cm} + ml_2^2}{mgl_2}}$$

Squaring on both side

$$\frac{I_{cm} + Ml_1^2}{mgl_1} = \frac{I_{cm} + Ml_2^2}{mgl_2}$$

$$(I_{cm} + ml_1^2) l_2 = (I_{cm} + Ml_2^2) \cdot l_1$$

$$I_{cm} l_2 + Ml_1^2 l_2 = I_{cm} l_1 + Ml_2^2 l_1$$

$$I_{cm} l_2 + I_{cm} l_1 = Ml_2^2 l_1 - Ml_1^2 l_2$$

$$I_{cm} (l_2 - l_1) = Ml_1 l_2 (l_2 - l_1)$$

$$I_{cm} = Ml_1 l_2$$

$$I_{cm} = Mk^2$$

$$k^2 = l_1 l_2 \Rightarrow k = \sqrt{l_1 l_2}$$

gyration of $k = \sqrt{l_1 l_2}$

$$T_1 = 2\pi \sqrt{\frac{Ml_1 l_2 + M_1 l_1^2}{mgl_1}} = 2\pi \sqrt{\frac{Ml_1 (l_1 + l_2)}{Ml_1 g}}$$

$$T = 2\pi\sqrt{\frac{l_1+l_2}{g}}$$

Squaring on both side

$$T^2 = 4\pi^2\left(\frac{l_1+l_2}{g}\right)$$

$$g = \frac{4\pi^2(l_1+l_2)}{T^2}$$

The gyration $K = \sqrt{l_1 l_2}$

The acceleration of gravity

$$g = \frac{4\pi^2(l_1+l_2)}{T^2}$$

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Department of PHYSICS

STUDENT STUDY PROJECT ON
INFRARED SECURITY
2017-18

M.A.L.D.GOVT. DEGREE COLLEGE GADWAL.
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INFRARED SECURITY ALARM

Submitted by

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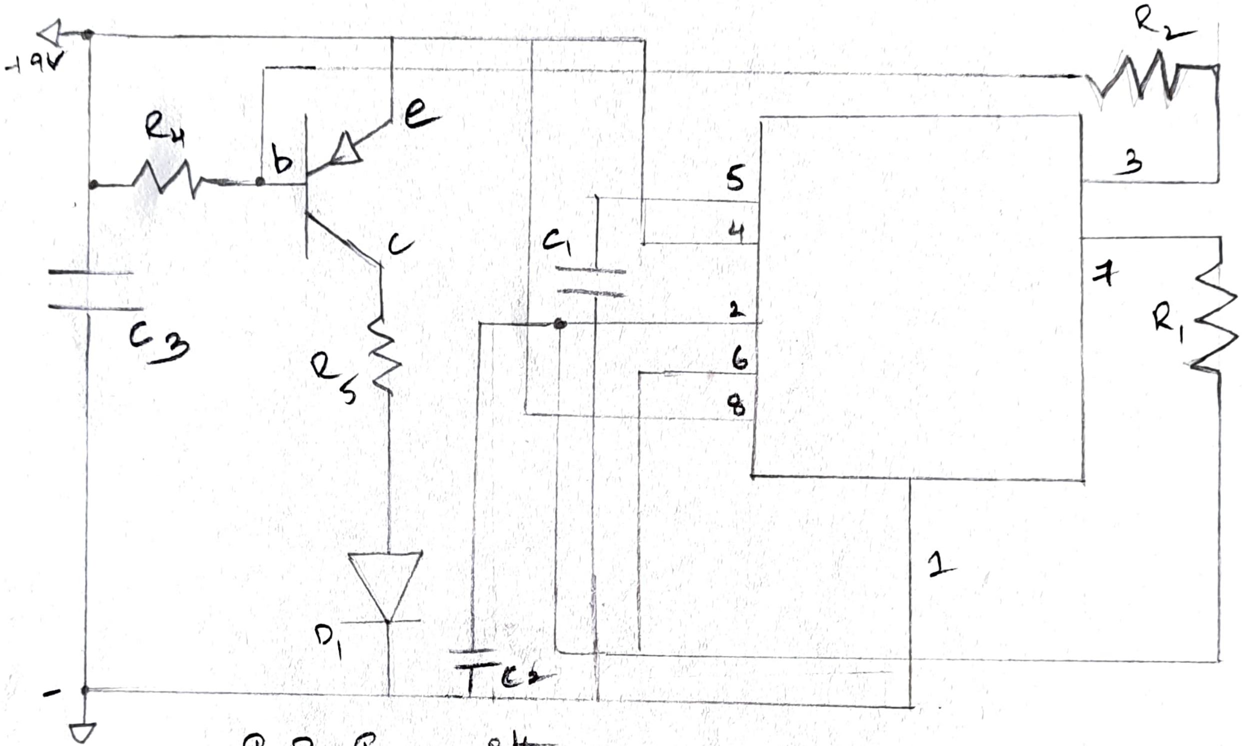
This infrared burglar alarm can be used to protect door, gate, corridor etc. Range of this alarm is 4-5 meters without lenses. Range can be Extended furthur by using lense and reflector with I.R. Sensors.

Transmitter Emits modulate infrared light beam. It is invisible to naked eyes. Reciever unit senses infrared signal from the transmitter and controls a buzzer or Relay. A relay can be used inplace of buzzer to control mains operated alarm or Load.

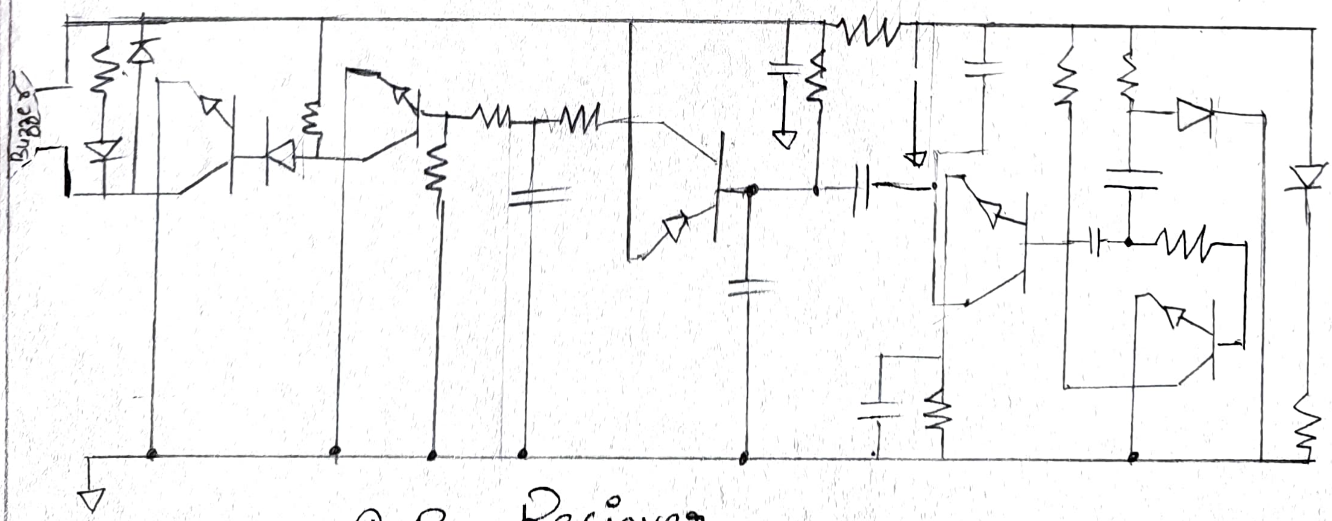
When reciever sense I.R signals from the transmitter, buzzer will not be activated. But when I.R. beam between Tx and Rx is interrupted, by an intruder or unexpected visitor or any non transparent object buzzer is activated.

For maximum range I.R LED of transmitter must be directed towards I.R photodiode reciever.

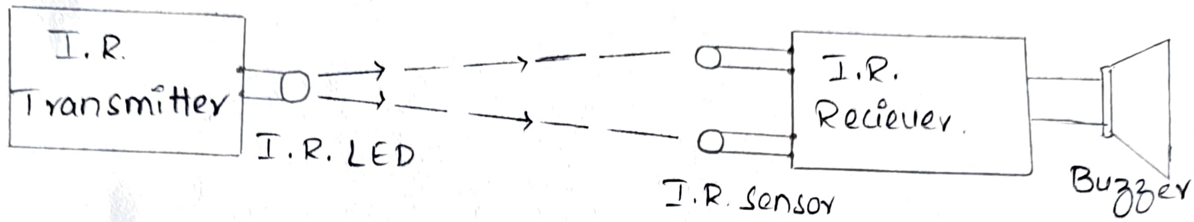
To improve range in darkness an Extra I.R LED may be used with reciever as shown here. It should be kept near to photodiode to increase its leakage currents.



I.R. Transmitter



I.R. Reciever



I.R.
Transmitter
I.R. LED
I.R. Sensor
I.R.
Reciever.
Buzzer

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Department of PHYSICS

STUDENT STUDY PROJECT ON

SHADOW ALARM CIRCUIT

2018-19

M.A.L.D.GOVT. DEGREE COLLEGE GADWAL.

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Shadow Alarm Circuit

Submitted By:

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K. Mounika

V. Kavya Sri

M. Sri Laxmi

J. Thirumalamma

B.Sc [M.P.C] T/M

III rd Year

Shadow Alarm Circuit

In this shadow alarm apparatus, two transisters are connected in series along with one resister.

LDR (Light Dependent Resister) acts as a sensor and when the light is off on this sensor, the buzzar start to work giving some noise.

In this circut,

1). Two transistors BC - 557
BC - 547

2). Three resistors 100 k , 3k , 1 k

3). 50 K variable resistor

4). 0.01 picofarad capacitor

5). One buzzer.

All the items are arranged on printed circuit board and 9V battery is connected in the circuit.

Uses :-

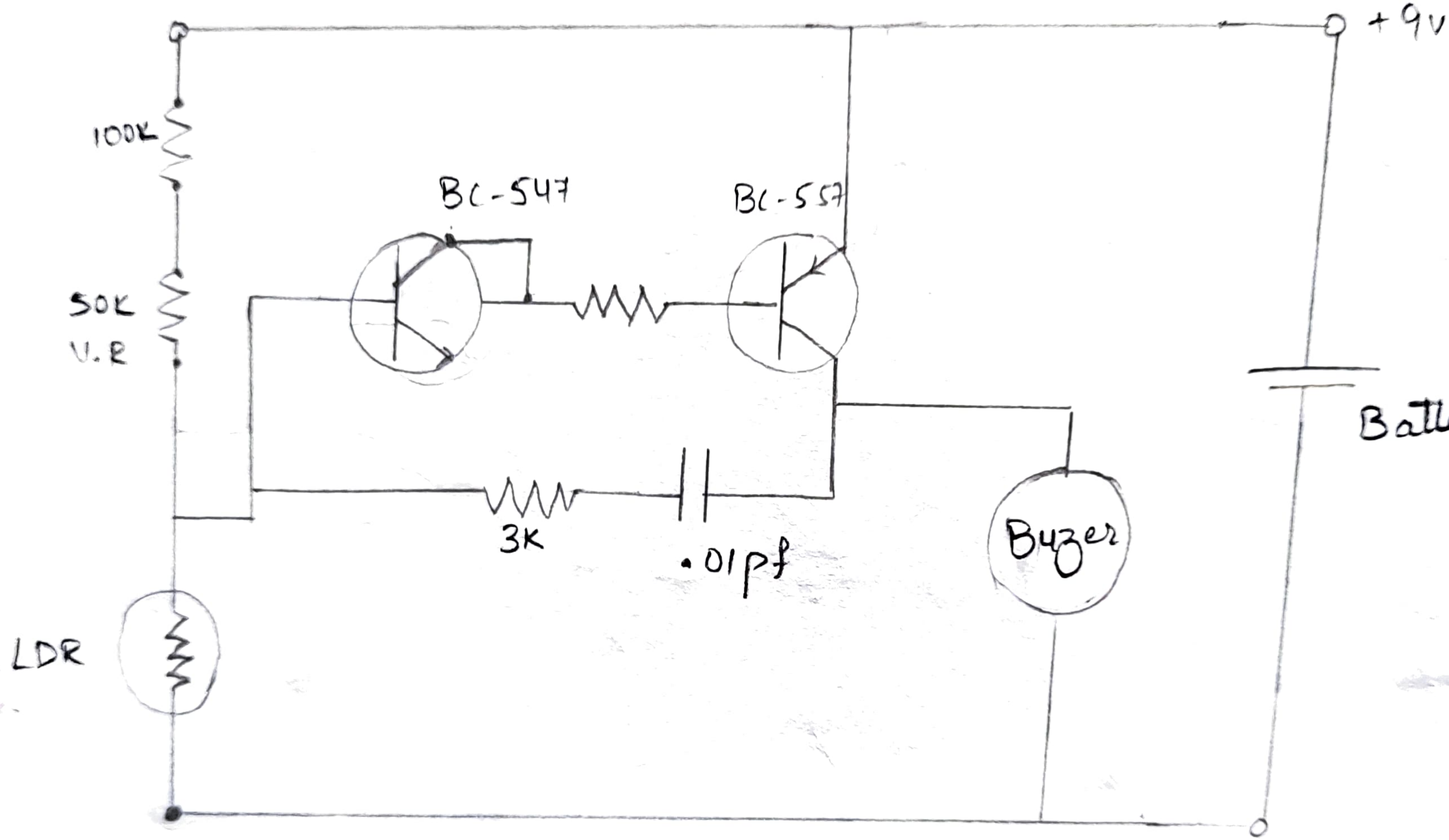
1). It is used as burgler alarm.

2). It is used as a sensor.

3). It is used in the counting machine.

4). It is used in counting the visitors at a certain place.

Shadow alarm circuit diagram



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Department of PHYSICS

STUDENT STUDY PROJECT ON
LOGICAL GATES
2019-20

M.A.L.D.GOVT. DEGREE COLLEGE GADWAL.
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PROJECT WORK ON
LOGICAL GATES

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ADDERS

Objectives :-

1. Quarter adder
2. Half adder
3. Full adder
4. parallel adder
5. Binary adder

Quarter adder

A quarter adder is a circuit that can add two binary digits but will not produce a carry this circuit will produce the following results.

truth table :-

Inputs		outputs
A	B	sum
0	0	0
0	1	1
1	0	1
1	1	0

You will notice that the output produced is the same as the output for the truth table of an x-OR. Therefore on X-OR gate can be used as a quarter adder.

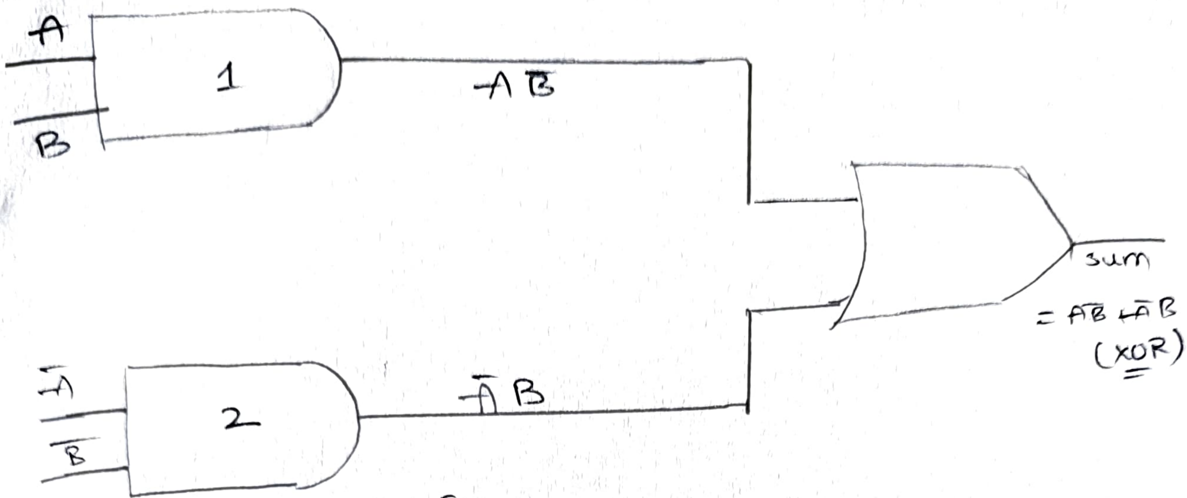
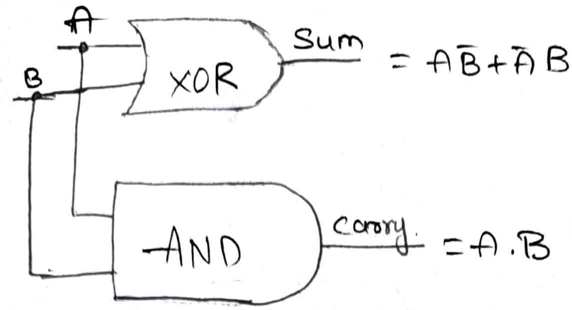


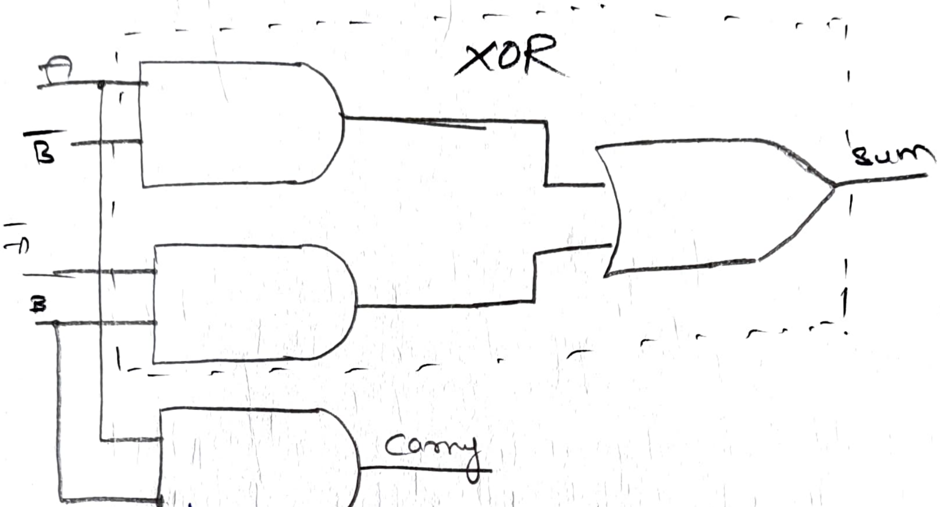
figure 7.
HALF ADDER

A half adder is designed to combine two binary digits and produce a carry.

Figure 2 shows two ways of constructing a half adder. An AND gate is added in parallel to the quarter adder to generate the carry. The SUM column of the truth table represents the output of the quarter adder, and the CARRY column represents the output of the AND gate.

Inputs		outputs.	
A	B	Sum	Carry
0	0	0	0
0	1	1	0
1	0	1	0
1	1	0	1





We have seen that the output of the quarter adder is HIGH when eigther input. but not both. is HIGH. It is only when both inputs are HIGH that the AND gate is activated and a carry is produced the largest sum that can be obtained from a half adder

FULL ADDER

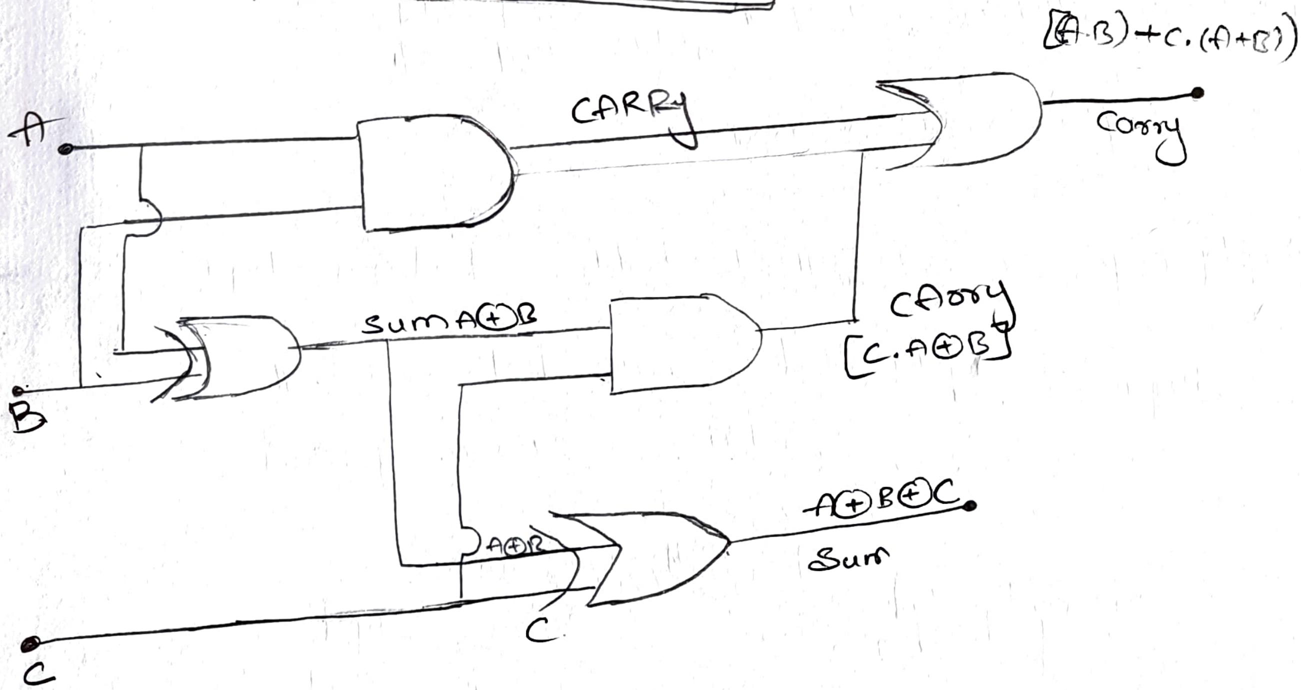
The full adder becomes necessary when a carry input must be added to the two binary digits to obtain the corrected sum. A half adder has no input for carries from previous circuits.

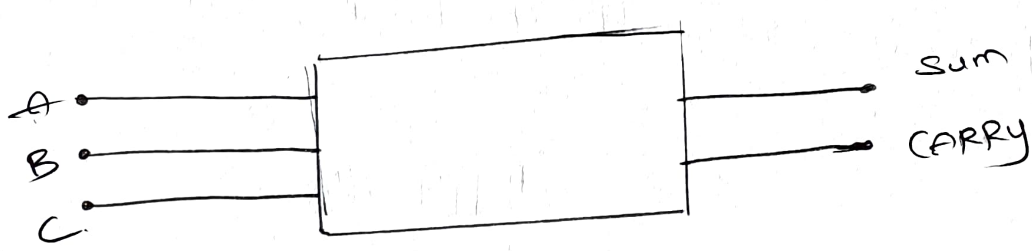
One method of constructing a full adder is to use two half adders one an OR gate as shown in figure 3. The inputs A and B are applied to gates

1 and 2. These make up one half adder. The sum output of this half adder and the carry from a previous circuit become the inputs to the second half adder. The carry from each half adder is applied to gate 5 to produce the carry-out for the circuit.

Truth table

Inputs			Outputs	
A	B	C	Carry	Sum
0	0	0	0	0
0	0	1	0	1
0	1	0	0	1
0	1	1	1	0
1	0	0	0	1
1	0	1	1	0
1	1	0	1	0
1	1	1	1	1





PARALLEL ADDERS

The adders discussed in the previous section have been limited to adding single-digit binary numbers and carries. The largest sum that can be obtained using a full adder is.

Parallel adders let us add multiple-digit numbers. If we place full adders in parallel we can and two-or-four digit numbers or any other size desired. Figure 4 uses STANDARD SYMBOLS to show a parallel adder parable of adding two, two-digit binary numbers. In previous discussions we have depicted circuits with individual logic gates shown. Standard symbols (blocks) allow us to analyse circuits which inputs and outputs only. one standard symbol may actually contain many and various types of gates and circuits. The addend would be input on the B inputs (B_2 = MSD, B_1 = LSD) for this explanation we will assume there is no input B inputs (B_2 = MSD. B_1=LSD) for this Explanation we will assume there is no input to (carry from a previous circuit)

Line No	Input An	Input Bn	Input Cn-1	Output Sn	Output Cn
1	0	0	0	0	0
2	0	0	1	1	0
3	0	1	0	1	0
4	0	1	1	0	1
5	1	0	0	1	0
6	1	0	1	0	1
7	1	1	0	0	1
8	0	1	1	0	1

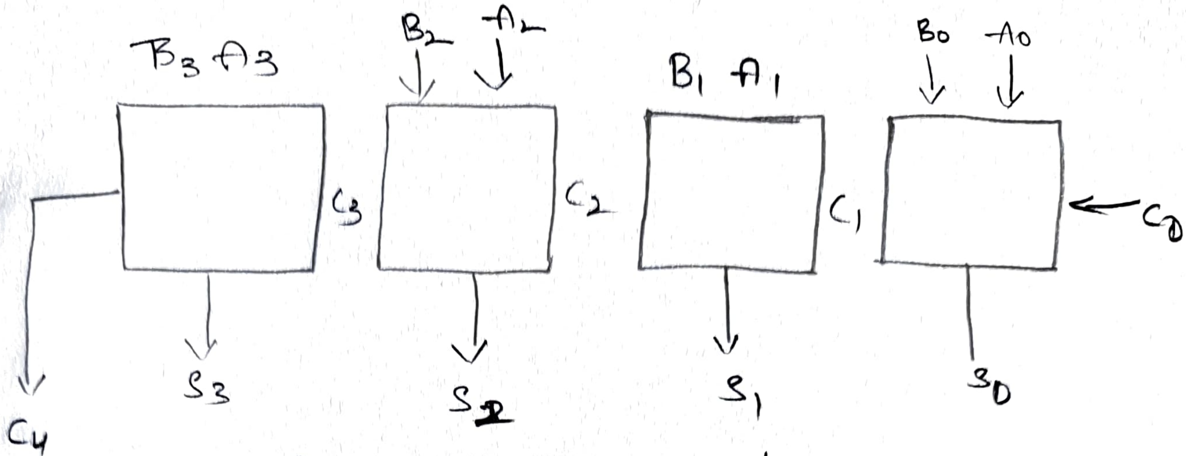
Binary Adder

(Asynchronous Ripple-carry adder)

→ A binary adder is a digital that produces the arithmetic sum of two binary numbers

→ A binary adder can be constructed with full adders connected in cascode with the output carry form each full adder connected to the input carry of the next full adder in the chain.

→ The four-bit adder is a typical example of a standard component. It can be used in many application involving arithmetic operations.



Four-bit Adder (Ripple carry Adder)

The input carry to the adder is C_0 and it ripples through the full adders to the output carry C_4. n-bit binary adder requires n full adders.

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STUDENT STUDY PROJECT ON

MOMENT OF INERTIA OF A FLY -WHEEL

2020-21

M.A.L.D.GOVT. DEGREE COLLEGE GADWAL.

Affiliated toPalamuru University, Mahabubnagar.

Department of PHYSICS

PROJECT WORK ON

MOMENT OF INERTIA OF A FLY -WHEEL

DONE BY

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PHYSICS

Project Work

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Class :- Degree first year

Group :- physics (B.sc (M.P.CS))

Subject :- physics

Experiment name :-

Moment of interia of a fly-wheel

MOMENT OF INERTIA OF A FLY-WHEEL

Introduction :

The fly wheel is shown in fig. 1. It is a circular wheel (w) of very large mass and is made of metal. This head circular wheel consists of a long axle a passing through its centre of mass as shown in fig. 1. The axle is horizontal and rotates on ball bearings which are fixed in a metal frame as shown in the figure. Due to its support on ball bearings, the friction due to rotation of the axle is minimized. As the axle "A" rotates, the wheel "W" also rotates along with it. Both of them rotate together.

There is a pelg "p" on the axle. The end of a long twine thread is made into a loop and is passed over the pelg. The twine thread. is wound over the axle without overlap in circular circles.

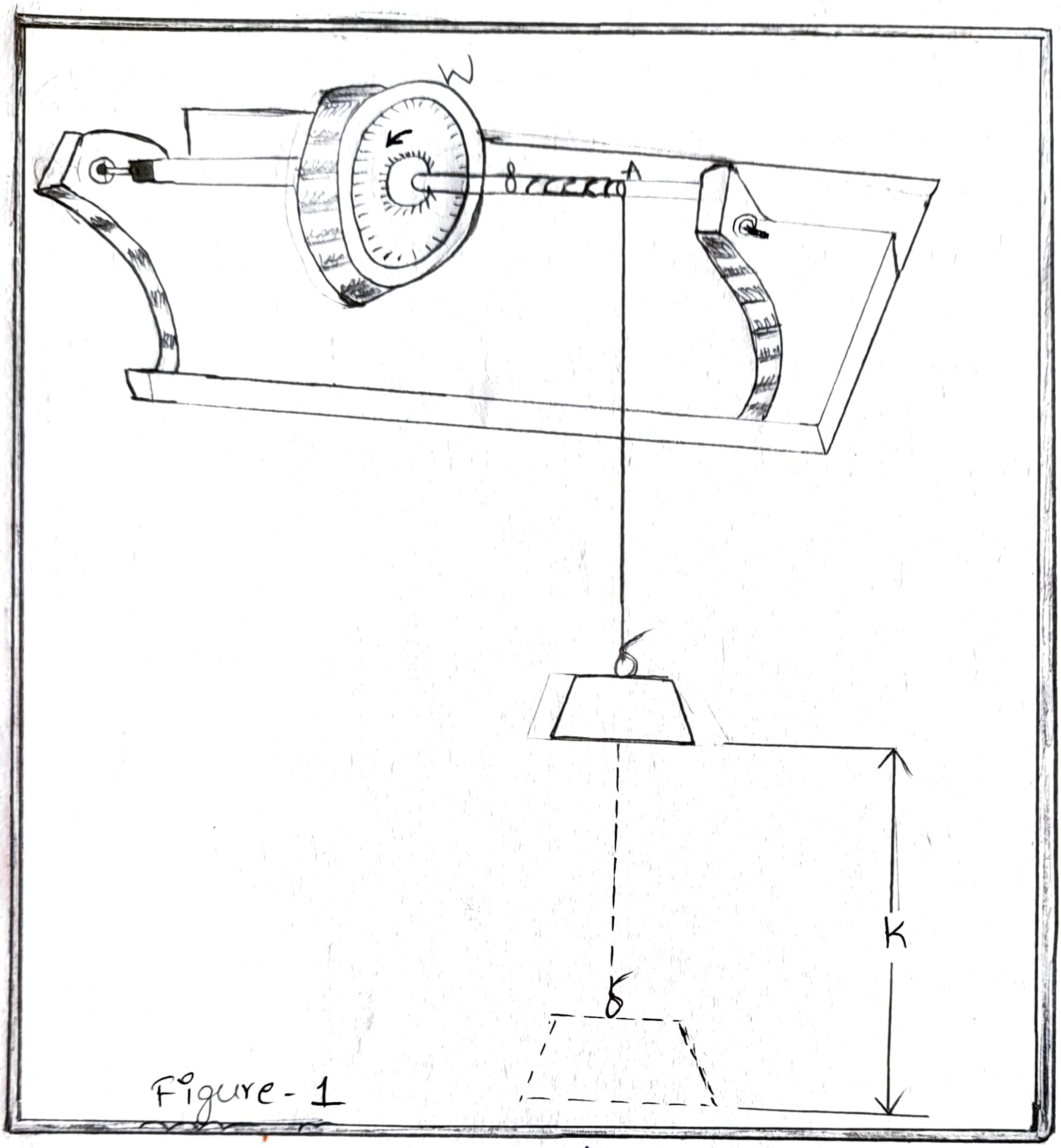

Figure - 1

The second end of the twine thread is attached to a Known mass "M". As shown in the fig - 1, the mass "m" will initially be at best at a height "h" above the ground. The height "h" and the length of the thread are so adjusted such that, when the mass "m" descends and finally touches the ground, The end of the thread around the peg should get detached from the peg and fall down. By this arrangement, we ensure that the number of windings of the thread on the axle is exactly equal to the number of rotations made (n_1) by the wheel during the descent of mass through height "h".

To count the number of rotations made by the fly wheel, a pointer is fixed in a horizontal position and infront of the fly wheel. (It is not shown in figure)

Just before the pointer, a horizantal line is drawn on the rim of the wheel. Every time, the mark (line) crosses the pointer the wheel computers one revolution.

Theory :-

Let us wind the twine thread n_1 times without any overlap over the axle, So that the mass "m" is stationary at a height "h" above the ground as shown in the figure. If the wheel is now released to rotate, then the thread gets detached from the peg "P" and simultaneously the mass 'm' touches the ground after n_1 revolutions of the wheel. The number of revolution made by the wheel during this time interval will be n_1.

The number of revolutions can also be counted from the horizontal mark on the rim and pointer arrangement also.

The stop clock is immediately started at the moment the mass touches the ground (and simultaneously the thread gets detached from the peg P) and the time taken

(t) and number of revolutions (n_2) made by the wheel from this instant till the wheel gets stopped are noted down.

Now, the potential energy lost by the mass (m) while descending through a height "h" is

$$P.E = mgh \rightarrow (1)$$

this energy got transformed in to three different forms. They are

i) The kinectic energy acquired by the mass (m)

$$K.E = \frac{1}{2}mv^2 \longrightarrow (2)$$

Here $v =$ The final linear velocity acquired by the mass $= r\omega \rightarrow (3)$

where

$r =$ radius of the axle and

$\omega =$ the angular velocity of the wheel (and axle) at the moment the mass touches the ground.

ii) The rotational kinetic energy about an acquired by the wheel.

$$\text{Rotational } K.E = \frac{1}{2} I \omega^2 \rightarrow (4)$$

I = moment of inertia of the wheel about on axis passing its centre of mass.

iii) The work done by the frictional forces against the rotational which results in the ultimate stopping of the rotation of the wheel.

Let the torque due to frictional force is τ. Then work done $(2\pi n_1)\tau \rightarrow (5)$

But

$$(2\pi n_2)\tau = \frac{1}{2} I \omega^2 \rightarrow (6)$$

And hence, work done against friction is

$$= 2\pi n_1 \frac{\frac{1}{2} I \omega^2}{2\pi n_2} = \frac{n_1}{2 n_2} I \omega^2 \rightarrow (7)$$

∴ from the law of conservation of energy we have

$$mgh = \frac{1}{2} mv^2 + \frac{1}{2} I \omega^2 + \frac{1}{2}\left(\frac{n_1}{n_2}\right) I \omega^2$$

$$= \frac{1}{2} m r^2 \omega^2 + \frac{1}{2} I \omega^2 \left(1 + \frac{n_1}{n_2}\right)$$

$$\therefore \left(1+\frac{n_1}{n_2}\right)\frac{1}{2}I\omega^2 = mgh - \frac{1}{2}mr^2\omega^2$$

$$\left(\frac{n_1+n_2}{n_2}\right)I = \frac{2mgh}{\omega^2} - mr^2$$

$$= m\left(\frac{2gh}{\omega^2} - r^2\right) \rightarrow (8)$$

$$\text{(i.e.,)} \quad I = \left(\frac{n_2}{n_1+n_2}\right)m\left[\frac{2gh}{\omega^2} - r^2\right] \rightarrow (9)$$

Now,

The angular velocity of the before making n_2 rotations $= \omega$.

The angular velocity of the wheel after marking n_2 rotations $= 0$. (as it gets stopped)

$\therefore$ Average angular velocity $= \frac{\omega+0}{2}$

$$= \frac{\omega}{2}$$

$$= \frac{2\pi n_2}{t}$$

$$\therefore \omega = \frac{t_1 \pi n_2}{t}$$

This value of "ω" is substituted in (10) to get I.

The moment of inertia of the fly wheel about an axis passing through its centre of mass

$I_2 = (I_1 \times 10^{-7})$ kg-m²

By noting down the mass of the wheel M and its radius R we can estimate its moment of inersia about an axis through its centre of mass $I = \frac{MR^2}{2}$ gm-cm².