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Fabrication of Multipurpose Farming Machine

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Abstract: ***Agriculture is the science and art of farming including cultivating the soil, producing crops and raising livestock. Modern agricultural techniques and equipments are not used by small land holders because these equipments are too expensive and difficult to acquire. The use of hand tools for land cultivation is still predominant in India because tractors require resources that many Indian farmers do not have easy access. This machine targets the small scale farmers who have land area of less than 2 acres. The multipurpose farming machine is doing two operations i.e. grass cutting and drilling holes for plantation purpose. The multipurpose farming machine is driven by 0.5 HP electrical motor, this power from motor, is provided through pulley to the cutter. The project is about a machine design which makes plantation and clearance of weeds much simpler .This weed harvester might be the solution to the problems faced by a small scale farmer regarding cost and labour implementation. After testing this machine in farm it is found that the cost of harvesting using this harvester is considerably less as compare to manual harvesting.***

Keywords: Weeds, Plantation, Cutter, Driller, Motor, Bevelgear

I. INTRODUCTION

This machine performs multipurpose operations at the same time with required speed and this machine is automatic which is controlled or operated by motor which is run with help of current. In India agriculture has facing serious challenges like scarcity of agricultural labour, in peak working seasons but also in normal time. This is mainly for increased nonfarm job opportunities having higher wage, migration of labour force to cities and low status of agricultural labours in the society. We have developed a conceptual model of a machine which would be capable of performing different operation simultaneously, and it should be economically efficient .In this project an attempt has been made for the design and fabrication of least maintenance multipurpose agricultural equipment exclusively for small farmers at cost not exceeding rupees 10000 per unit. This equipment uses combined blades for efficient weed cutting and drilling holes for plantation. The machine operates through motor drive with bevel gear mechanism, which paves the ways to carry out all these three operations exactly at the same time. It can drill holeupto 1.5 feet.

II. SCOPE OF THE PROBLEM

In spite of the large scale mechanisation of agriculture in some parts of the country, most of the agricultural operations in larger parts are carried on by human hand using simple and conventional tools and implements like wooden plough, sickle, etc. Little or no use of machines is made in ploughing, sowing, irrigating, thinning and pruning, weeding, harvesting threshing and transporting the crops. This is specially the case with small and marginal farmers. It results in huge wastage of human labour and in low yields per capita labour force. There is urgent need to mechanise the agricultural operations so that wastage of labour force is avoided and farming is made convenient and efficient. Agricultural implements and machinery are a crucial input for efficient and timely agricultural operations. Strategies and programmes have been directed towards replacement of traditional and inefficient implements by improved ones, enabling the farmer to own multipurpose farming machine for weed harvesting and plantation of plants

III. CONSTRUCTION

A. Motor

Fig 1: Motor

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The motor is converted into electrical mechanical energy .Both sides are connected to the power transfer through the belt in one area and the power transfer through the belt in another. Motor rpm is capable of 2100rpm.Its speed is oriented in the same direction and works.

B. Pillow Ball Bearing

Fig 2: Pillow ball bearing

They are used heavily to make the shaft rotate easily. The Allen key system can be adjusted to suit the shaft. Each mounted unit, including a mounted bearing, acts as a system to position the bearing securely for reliable operation

C. Driller

Fig 3: Driller

It is blade-like structure is fitted at 90 degrees and your cutting angle is 60 degrees. Rotates at uniform directional speed at equal intervals. In our case the purpose is to make a small hole of 25mm diameter so the auger is scaled down to a smaller size having the diameter suited for the above purpose and a depth of 50mm.

D. Bevel Gear

Fig 4: Bevel gear

Bevel gears are meshed so that the points of their cones are coincident. As we move towards the point of the cones, the number of teeth remains the same. Bevel gears are most often mounted on shafts that are 90 degrees apart, but can be designed to work at other angles as well. Power is transmitted from the motor to the available pulley and the shaft is rotated in the opposite direction by means of power transmissionfrom v belt and bevel gear. And the measurements are Teeth distance with 10mm, Teeth length with 20.6mm and Diameter with 90mm.

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Volume 8 Issue III Mar 2020- Available at www.ijraset.com

E. V- Belt

Fig 5: V-Belt

The prescribed belt type for the given distance between the two pulleys is V belt and the sizes of the belts are A49 for Drilling action and A48 for Cutting action.

F. Wheel

Fig 6:Wheel

The wheels that are made up of plastic are used which will bear minimum weight that they can move with ease in the farm.

G. Pulley

Fig 7: Pulley

A pulley is a wheel on an axle or shaft that is designed to support movement and or transfer of power between the shaft, cable or belt. The diameter of the pulley that powered the cutting force is 110.4mm and the drilling power is carried over by the pulley with diameter of 60.3mm.

H. Cutter

Fig 8: Cutter

In this process the motor is used to cut the weeds with the help of cutter blade. The total length of the cutting shafts (cutter) is 3 feet with distance in between each blades are 170mm and the total blades included in the cutter are 28 blades made up of steel rod.

I. Tachometer

Fig 9: Tachometer

The Tachometer is used throughout this work to measure the rpm of the electric motor with load and no load conditions. At load condition the cutter and driller are connected with the motor.

J. Content Of The Farming Machine

S.No	SPECIFICATION	SIZE/UNITS
01	BASE	1200cmx900cm
02	HEIGHT	1200cm
03	MOTOR POWER	0.5hp
04	MOTOR SPEED	2100rpm
05	PULLEY	d1=d2=d3=6cm and d4=11cm
06	SHEET	1200cmx900cm
07	V BELT	A48&A49
08	BEVEL GEAR	d1=d2=2cm
09	TOTAL SHAFT WEIGHT	5Kg

Table 3.1: Content of The Farming Machine

The specifications mentioned in the above table are used in the fabrication of multipurpose farming machine. The materials are weight-bearing and can withstand high vibration.

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Volume 8 Issue III Mar 2020- Available at www.ijraset.com

IV. METHODOLOGY

A proposed solution over the present state of art is being explained through this article. This machine has two sections for motor assist. The power of the motor is passed from the pulley to the belt through a section of the cutter.Power is transferred through the belt through another area by means of the bevel gear to the driller.

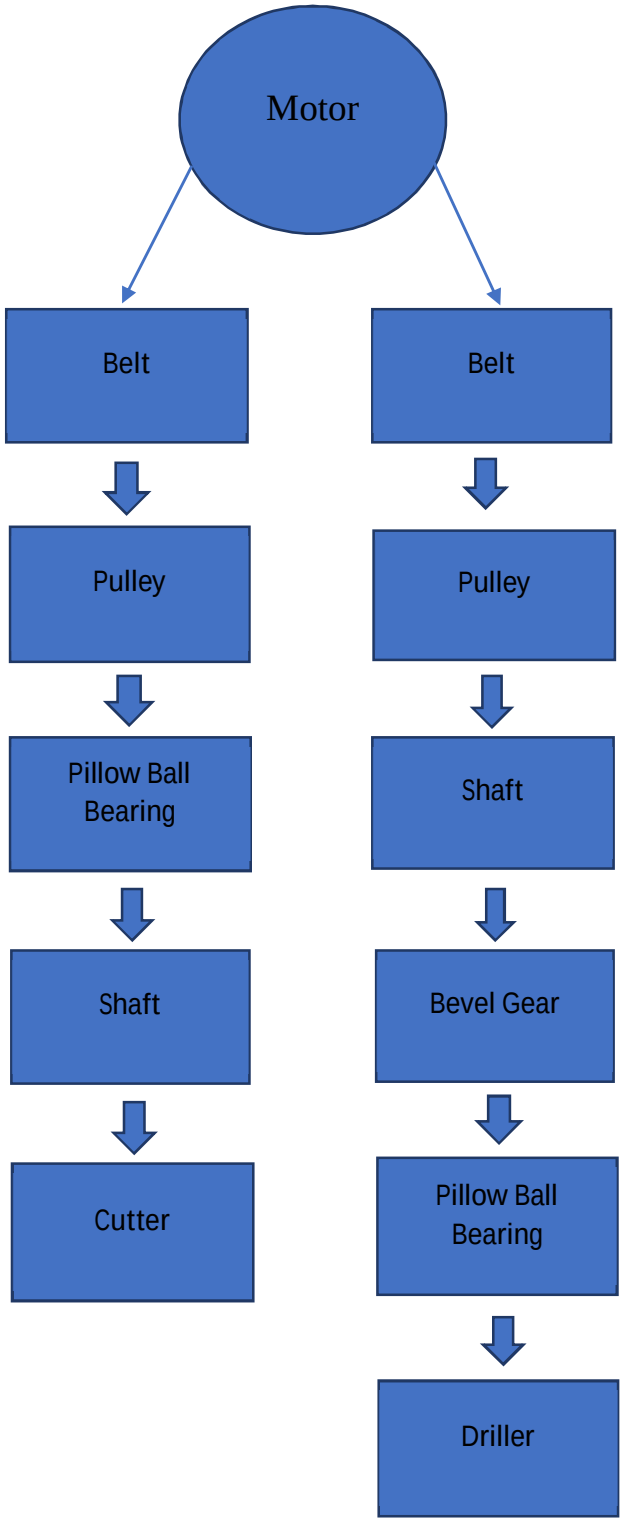

Fig 4.1: Flow Diagram

A. Working Model

Fig 4.2Fabrication of Multipurpose Farming Equipment

The above model represents the completed work of the multipurpose farming machine that is capable of performing both weed cutting and drilling plantation holes for agriculture purpose

V. COST ESTIMATION

Table 5.1: Cost Estimation of the Multipurpose Farming Machine

SI.NO	COMPONENTS	QUANTITY	PRICE / PART(Rs)	TOTAL COST(Rs.)
1	ELECTRIC MOTOR	1	2500	2500
2	BEVEL GEAR	2	935	1870
3	PULLEY	4	212	850
4	DRILLER	1	280	280
5	CUTTER blade	1	560	560
6	SHAFT	1	160	160
7	49″ V – BELT	1	250	250
8	48″ V-BELT	1	230	230
9	BALL BEARING	1	40	40
10	WHEEL	4	150	600
11	PILLOW BALL BEARING	6	216	1300
12	STEEL SQUARE	1	1000	1000
13	ALUMINIUM SHEET	1	470	470
14	OPEN COILED HELICAL SPRING	1	50	50
15	WELDING ROD	55	3	160
16	POWER SUPPLY UNIT	1	120	120
17	PAINTING	2	125	250
18	OTHERS	-	200	200
	TOTAL	-	-	10,890

The total amount spent to completion of this project is of about Ten Thousand Eight Hundred Ninety Rupees only.

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VI. RESULTS

NO LOAD (in RPM)	
MOTOR	CUTTER
1880.2	1771.0
1853.4	1761.2
1796.4	1733.3
1769.6	1692.0
1768.0	1622.3
1764.4	1568.2

Table 6.1 : Test results at No Load (Motor Vs Cutter)

The above table represents the reading of 0.5HP electric motor at no load condition with varying power supply i.e., Usage of other electrical appliances/motors/machineries at the same time.

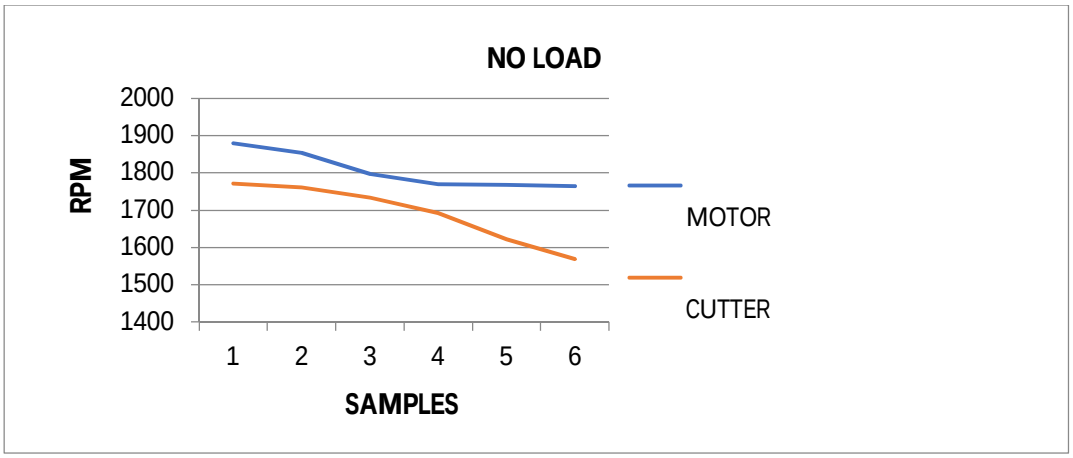

Fig 6.1: Test results at No Load (Motor Vs Cutter)

The figure 6.1 resembles the output of motor at no load condition which is greater than the cutter connected to the motor, whereas the cutter was not loaded to the field for cutting process.

NO LOAD(in RPM)	
MOTOR	DRILLER
1880.2	560.4
1853.4	553.2
1796.4	547.2
1769.6	543.2
1768.0	541.0
1764.4	529.0

Table 6.2 : Test results at No Load (Motor Vs Driller)

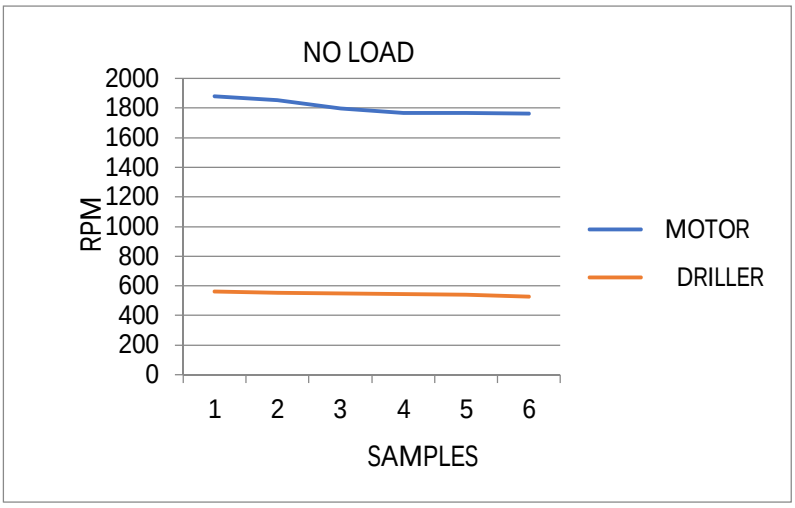

Fig 6.2: Test results at No Load (Motor Vs Driller)

The figure 6.2 resembles the output of motor at no load condition which is greater than the driller connected to the motor, whereas the driller was not loaded to the field for drilling process. The multipurpose farming machine was made to work in four types of land to obtain the various results that are described below with tabulation and charts.

LAND	LOAD(in RPM)	
	CUTTER	DRILLER
1	412.3	444.3
	337.5	397.5
	323.4	356.7

Table 6.3 : Test results at Load (Cutter Vs Driller) at Land 1

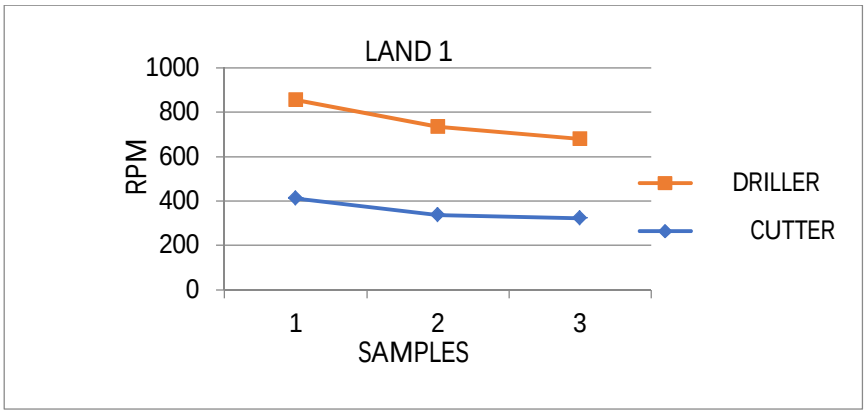

Fig 6.3: Test results at Load (Cutter Vs Driller) at Land 1

LAND	LOAD(in RPM)	
	CUTTER	DRILLER
2	519.3	586.2
	489.8	505.3
	337.5	485.4

Table 6.4 : Test results at Load (Cutter Vs Driller) at Land 2

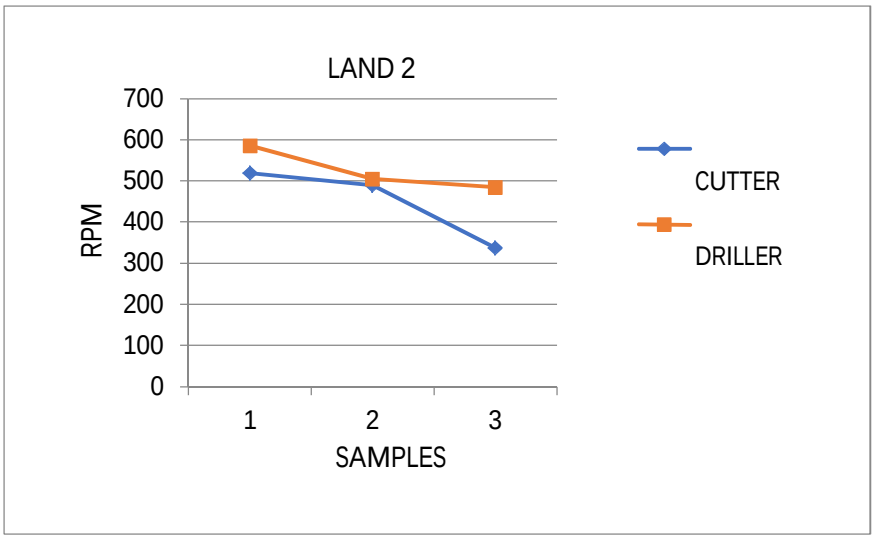

Fig 6.4: Test results at Load (Cutter Vs Driller) at Land 2

LAND	LOAD(in RPM)	
	CUTTER	DRILLER
3	552.4	575.2
	485.4	543.5
	395.0	487.3

Table 6.5 : Test results at Load (Cutter Vs Driller) at Land 3

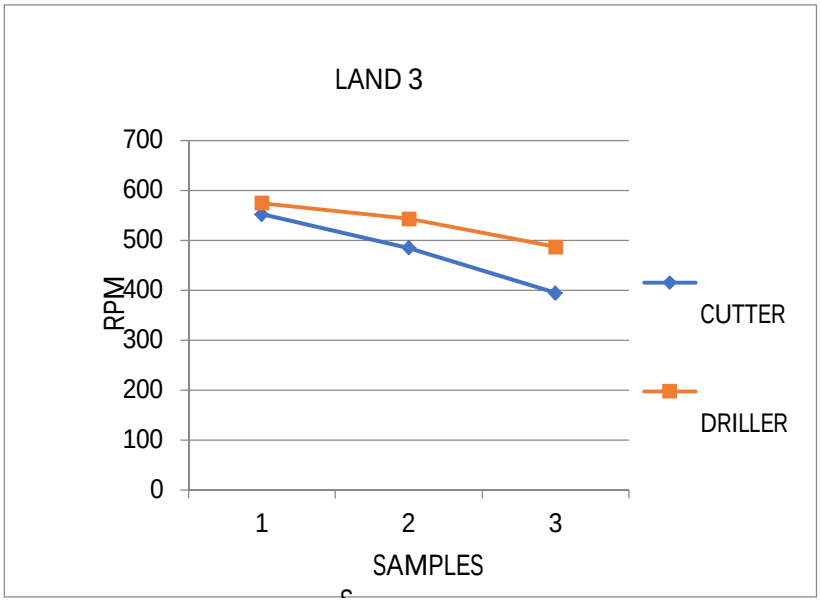

Fig 6.5: Test results at Load (Cutter Vs Driller) at Land 3

LAND	LOAD(in RPM)	
	CUTTER	DRILLER
4	800.4	512.3
	799.2	493.4
	731.2	467.5

Table 6.6 : Test results at Load (Cutter Vs Driller) at Land4

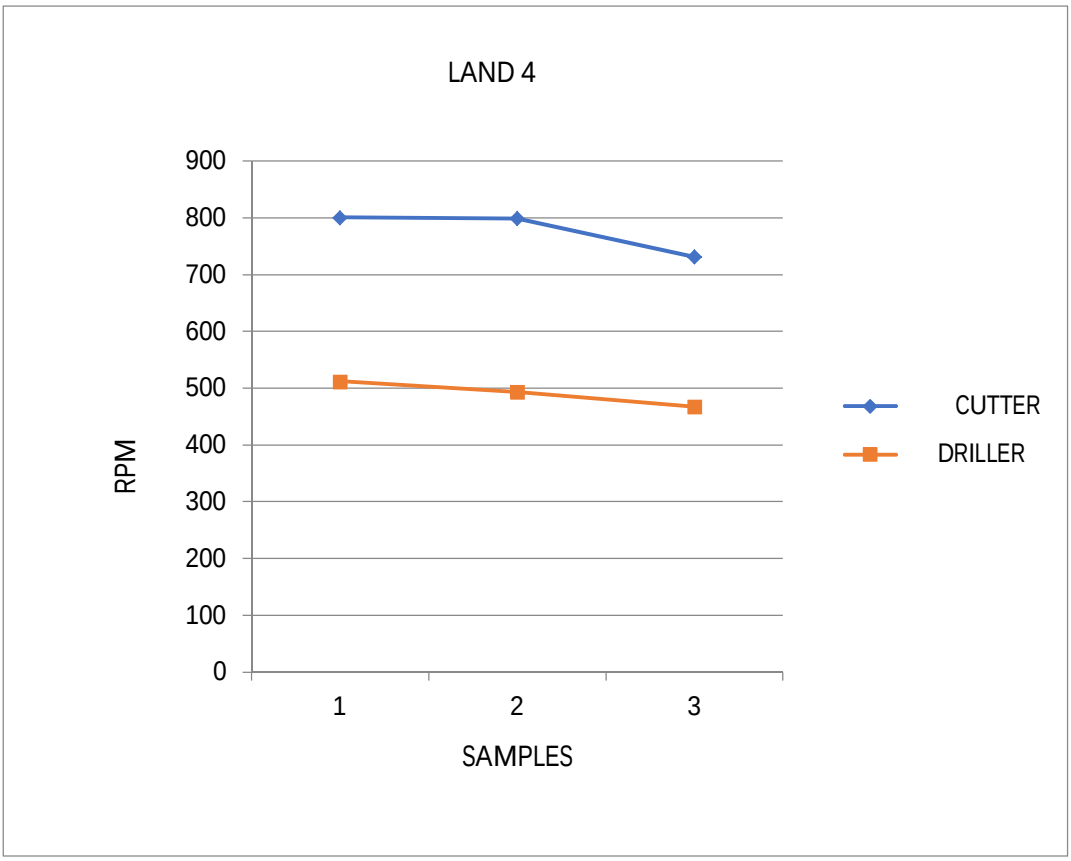

Fig 6.6: Test results at Load (Cutter Vs Driller) at Land 4

The vary in rotation per minute of the motor with respect to cutter and driller is due to toughness of the soil at various places are explained with various tables and charts. These readings are obtained with use of digital tachometer.

VII. CONCLUSION

The fabrication of multipurpose farming machine was developed to the small scale farmers for the usage of domestic purpose which make them to reduce the labour cost and duration to clean the weeds grown in the field and also to plant more trees to support eco friendly environment by planting more trees at lesser time. The developed model is framed with less maintenance and also easy to handle by any sort of people. Therefore the designed machine can minimize the man power and support the growth of farmers.

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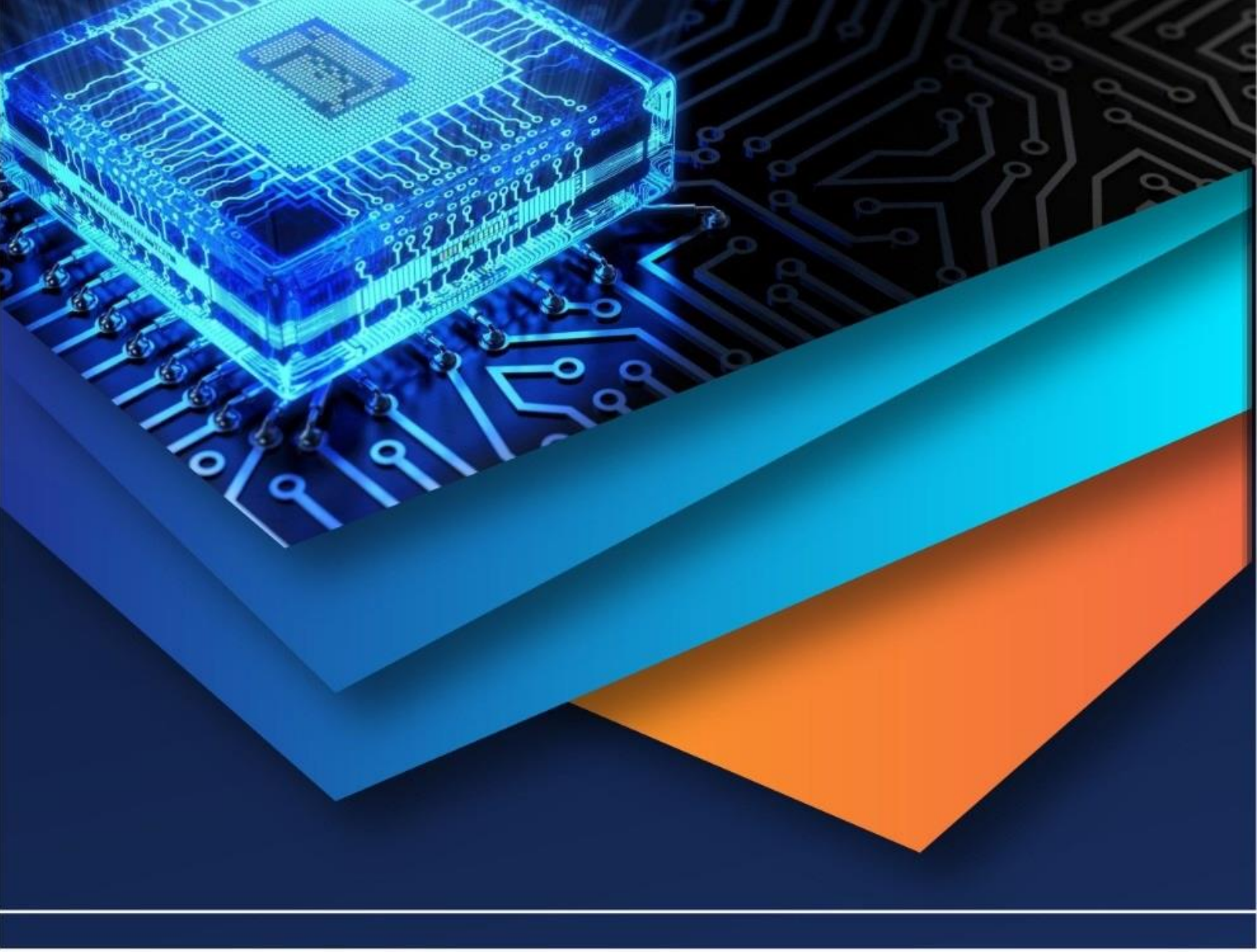

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