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Rotary Parking System for Multi-Purpose Vehicle

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Abstract: Lack of space availability has always been a problem in urban areas and major cities and to add to it there are vehicles parked callously on the streets that further limit the space. This system has been implemented to reduce the excess use of land space which is already very scarce in metro cities. Different types of vehicle parking are applied worldwide namely Multi-level Automated Car Parking, Automated Car Parking System, and Rotary Parking System. In India, peoples are very convenient to park the car in rotary parking system. Now a day this parking system used only for cars in many areas like textiles, super market, industries, apartments, malls and public places. The present project work is aimed to develop a reduced working model of vehicles parking system for park multiple vehicles like heavy vehicle, medium vehicle and light duty vehicle with in an actual parking area by using microcontroller. The chain and sprocket mechanism is used for driving the parking platform. This total prototype is powered by a D.C motor. When the vehicle comes on the ramp the switch will be activated and the bucket comes to carry the vehicle. When the switch will be operated by the user, sprockets starts to rotate and the new space will be adjusted for new vehicle. So we took this opportunity to bring the technology of automated parking to where it is needed.
Key words: car parking system, rotary, textiles, industries, heavy vehicle, lack of space.

I. INTRODUCTION

Automated parking system was actually first developed in 1925 by Max Miller in New York City. The designs original purpose was simple to lift a vehicle off the ground, such as in the case of a stalled or broken down car on a street. It was never used.

II. AUTOMATED CAR PARKING

The driver will pull the car onto a computer- controlled pallet, turn it off, and get out. The pallet is then lowered into the abyss of parking spaces, much like a freight elevator for cars, except it can also move sideways, not just up and down. There's an array of laser sensors that let the system know if the car doesn't fit on the pallet (although it's big enough to fit a mid-sized SUV),. The system retrieves the car when the driver returns, although this might take some time and creative manoeuvring. Cars are parked two deep in some spots, so a specially tailored software system has to figure out the logistics of shuffling the various vehicles around as needed to retrieve a specific car. And for those, like me, who find it difficult to turn their vehicle around after pulling out of a space, there's an underground turntable that turns the car around before it is lifted to the surface, so the car is facing out into the driveway, ready to go. Backing out of garages or parking spaces is one of the most common causes of accidents.

III. MULTI-LEVEL PARKING

A multi-level car parking is essentially a building with number of floors or layers for the cars to be parked. The different levels are accessed through interior or exterior ramps. An automated car parking has mechanized lifts which transport the car to the different levels. Therefore, these car parks need less building volume and less ground space and thus save on the cost of the building. It also does away the need for employing too many personal to monitor the place. In an automated car parking, the cars are left at the entrance and are further transported inside the building by robot trolley. Similarly, they are retrieved by the trolley and placed at the exit for the owner to drive away.

IV. DESCRIPTION OF EQUIPMENT'S

A. Motor

An electric motor uses electrical energy to produce mechanical energy. The reverse process which of using mechanical energy to produce electrical energy is accomplished by a generator or dynamo. Traction motors used on locomotives and some electric and hybrid automobiles often performs both tasks if the vehicle is equipped with dynamic brakes.

B. Control Unit

RFID Tag/Reader Radio frequency (RF) technology is used in many different applications, such as television, radio, cellular phones,

radar, and automatic identification systems. RFID stands for radio frequency identification and describes the use of radio frequency signals to provide automatic identification.

1) How radio frequency identification (rfid) works RFID systems consist of three components in two combinations: a transceiver (transmitter/receiver) and antenna are usually combined as an RFID reader. A transponder (transmitter/responder) and antenna are combined to make an RFID. An RFID tag is read when the reader emits a radio signal that activates the transponder, which sends data back to the transceiver.

2) A basic RFID system consists of three components

a) An antenna or coil

b) A transceiver (with decoder)

c) A transponder (RF tag) electronically programmed with unique information.

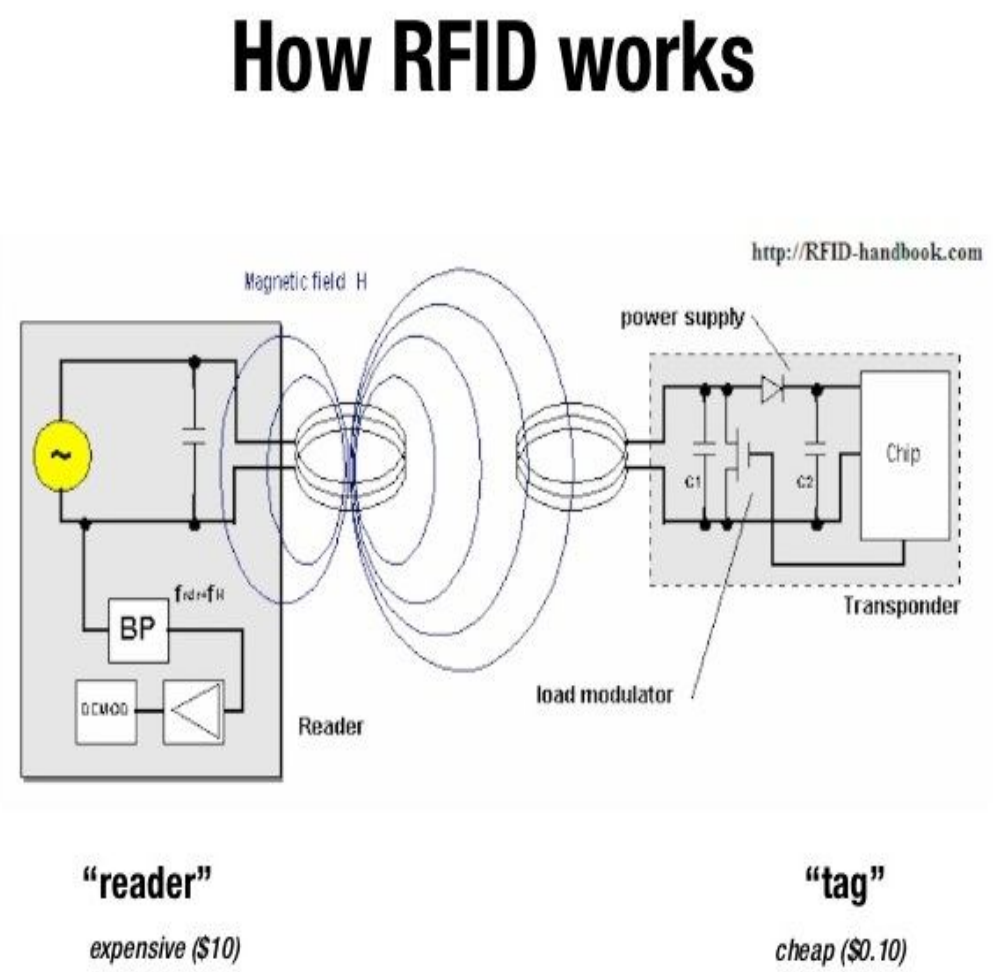

Fig.1. RFID block diagram

C. Mechanical Components For Assembly

1) Joint

2) Pallet

3) Frame

4) Chain

5) Hanging Rod

6) Sprocket

7) Bearing

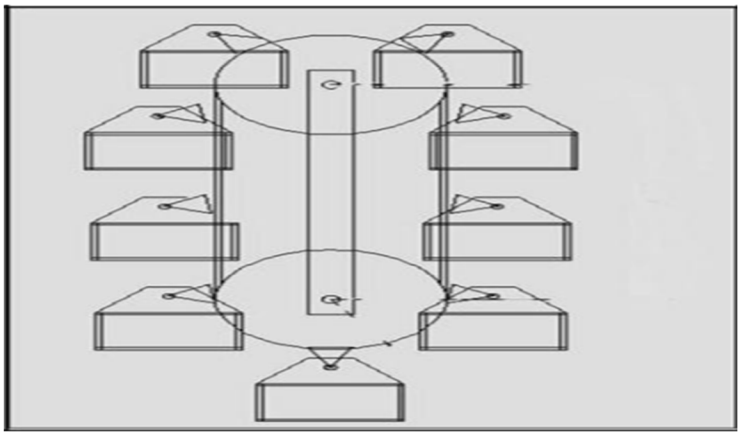

Fig 2. Mechanical assembly

V. MODEL CACULATION FOR THE MECHANICAL ASSEMBLY

A. Joint

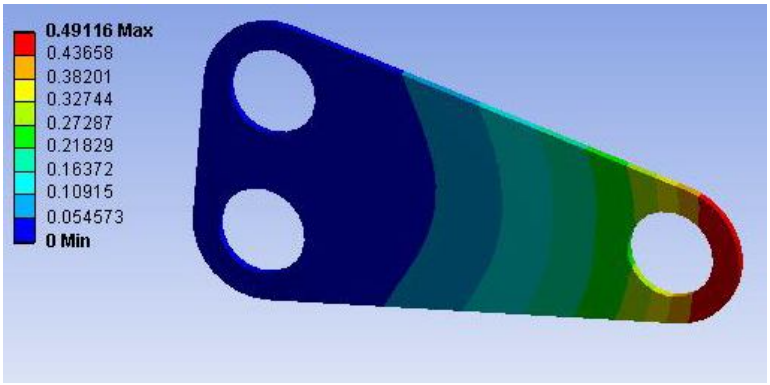

Fig. 3 Joint

Total load on a joint = [Weight of vehicle + Weight of Pallet + Weight of Rod] /2

B. Pallet

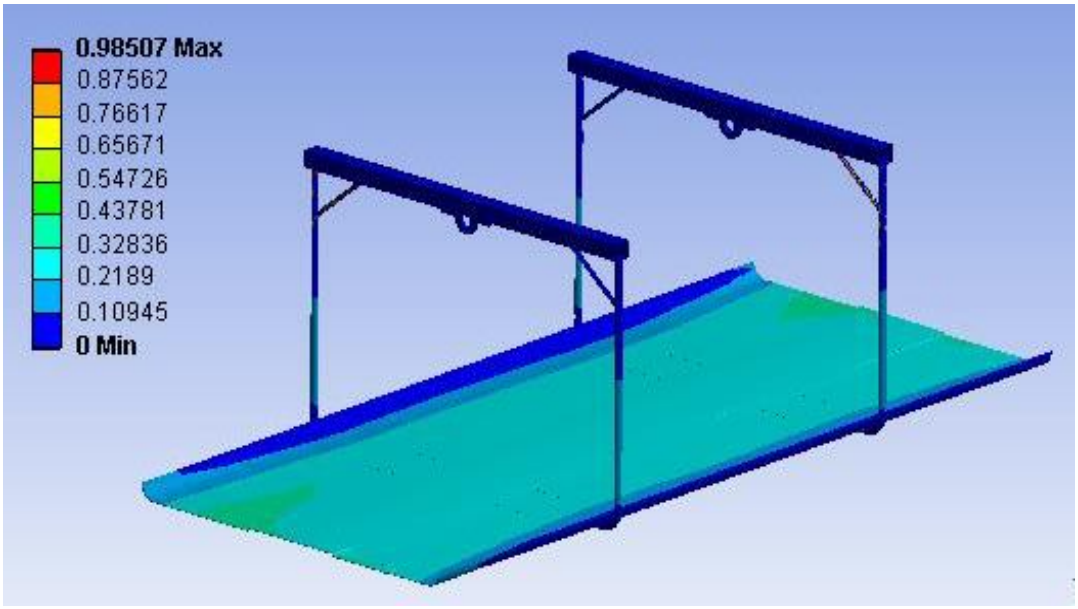

Fig. 4 Pallet

1) Vehicle Specifications

Vehicle size=4854mm*2197mm*1476mm

Wheel base = 3000 mm,

Wheel track = 1800 mm

Max Weight of Vehicle= 1985 ~ 2500 kg

2) Pallet Specifications

Thickness = 5 mm…. (Considering the load of vehicle & Analysis is done)

Length = 5000 mm

Width = 2317.5 mm

Height = 1650.7 mm

Mass of a car is =2500 kg

Total load on pallet = 2500*9.81 = 24500 N

C. Total Load On The Frame

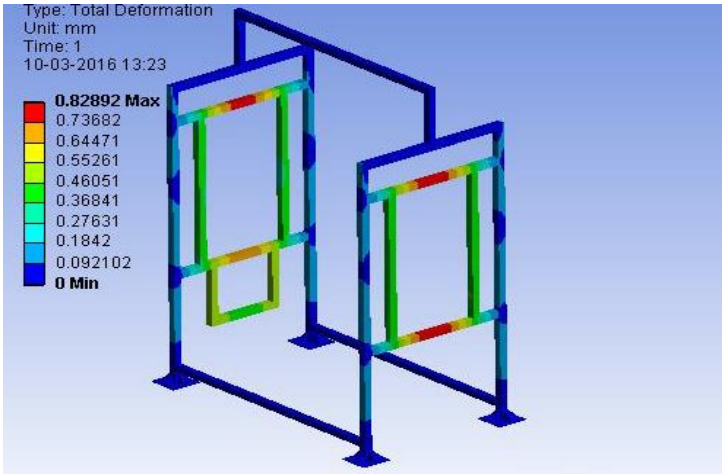

Fig. 5 Frame

Total load on the Frame = {Weight of vehicle × 8 + Weight of Pallet×8 +Weight of Rod×8 + Weight of Chain×2 + Weight of Rotor×4 + Weight of Joint×16 + Miscellaneous}

D. Hanging Rod

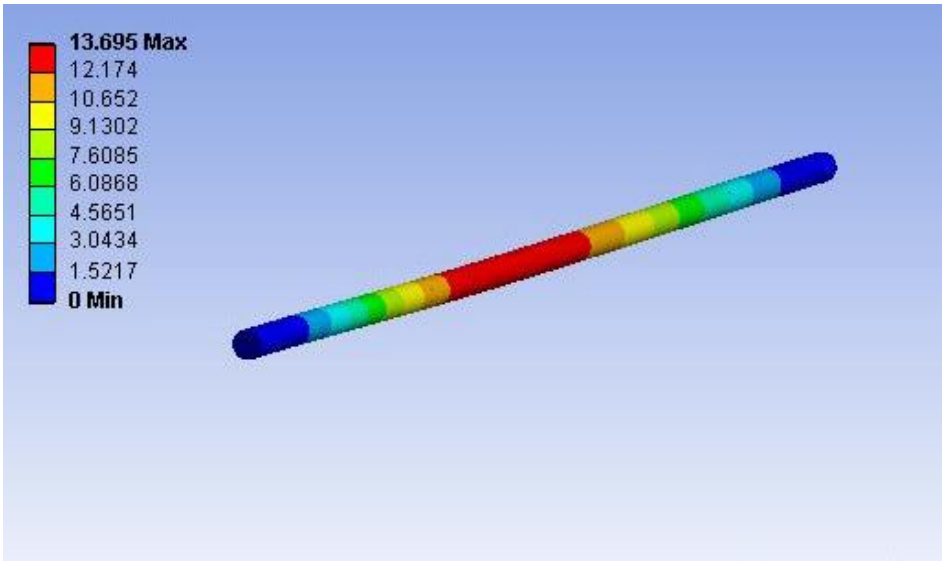

Fig. 6. Hanging rod

1) Hanging Rod

Length = 5766 mm

Diameter = 100mm

Total load on the Rod = Weight of vehicle + weight of Pallet.

Mass of the Pallet = 575kg (Calculated Using CREO Software)

= 575×9.81 + 2500×9.81

= 30165.75 N

2) Weight of Pallet

Mass of the Pallet = 575kg (Calculated Using CREO Software)

= 575×9.81 + 2500×9.81

= 30165.75 N.

VI. ROTARY PARKING SYSTEM FOR MULTI PURPOSE VEHICLES

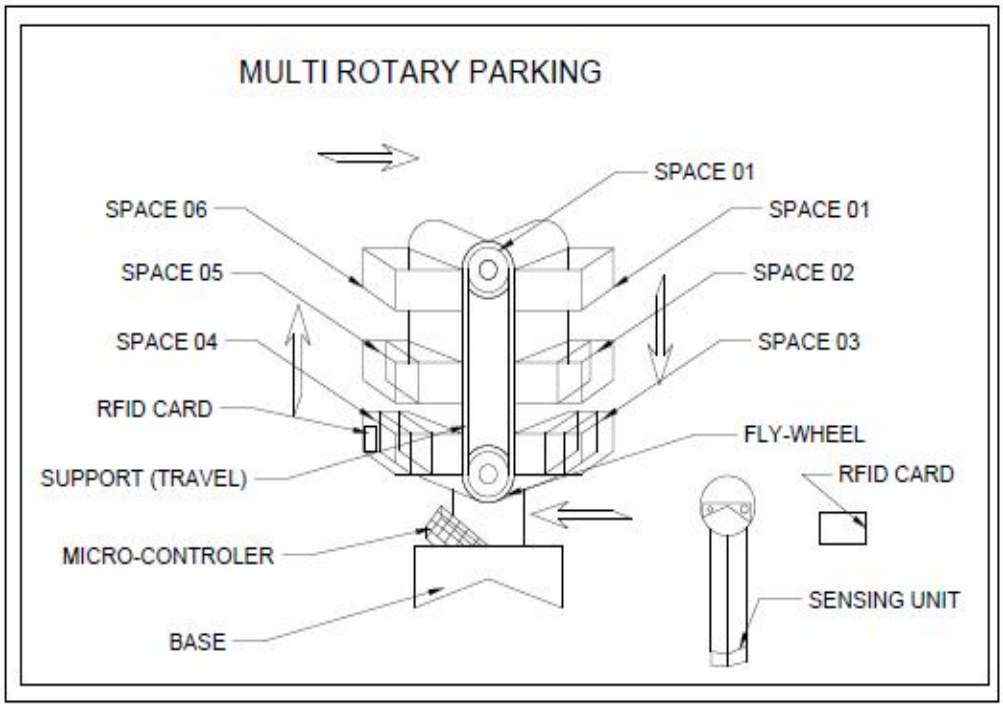

Fig.7. Over all assembly

VII. SYSTEM SPECIFICATIONS

A. Motor Power – 14 Kw.

B. Rotating Speed – 6 M/Min.

C. Rotating Technology - Rotation By Chain.

D. Power - 400V Three-Phase.

VIII. WORKING PRINCIPLE

The motor is connected to the shaft of the main shaft. The motor is controlled by means of a control unit.(RFID) The other shafts for the parking shells are connected to the shaft. It differs according to the parking system & multi vehicle (car, truck, etc.,). The motor should be mounted such that it could withstand high loads. When the user wants to park his vehicle, he has to search for the parking shell by running the motor first of all. While getting the appropriate parking shell the user should stop the motor and drive the vehicle into the shell. After the parking of the first vehicle the next vehicle also follows the same procedure to get parked into the shell. The shells are arranged by means of pin support in the model so that it can be hang in a horizontal position at any height.

IX. ADVANTAGES

A. Within The Less Space, We Can Park More Cars.
B. Safety Systems For Vehicle.
C. All Vehicles Are Park In Particular Place.
D. Easy Handling.
E. Reduce Place Consumption.

X. APPLICATIONS

A. It can be used in super markets.
B. It can be used in apartments.
C. It can be used in Industries.
D. It can be used in mall and public places.
E. It ensures quick and automated parking and easy retrieval of vehicles.

XI. CONCLUSION

This system has been designed and all the composite parts in it have been manufactured and assembled. Analysis of the model has to be done while developing a life size model. The mechanical model has been designed and the software as well as the control circuit has been implemented successfully. It demonstrates the working of the planned rotary parking system. The size and number of trolleys can be customized according to the needs and capacity of the organization or garage space availability.

XII. FUTURE SCOPE

The platforms can also be equipped with safety sensors guiding the movement of vehicles in the platforms.

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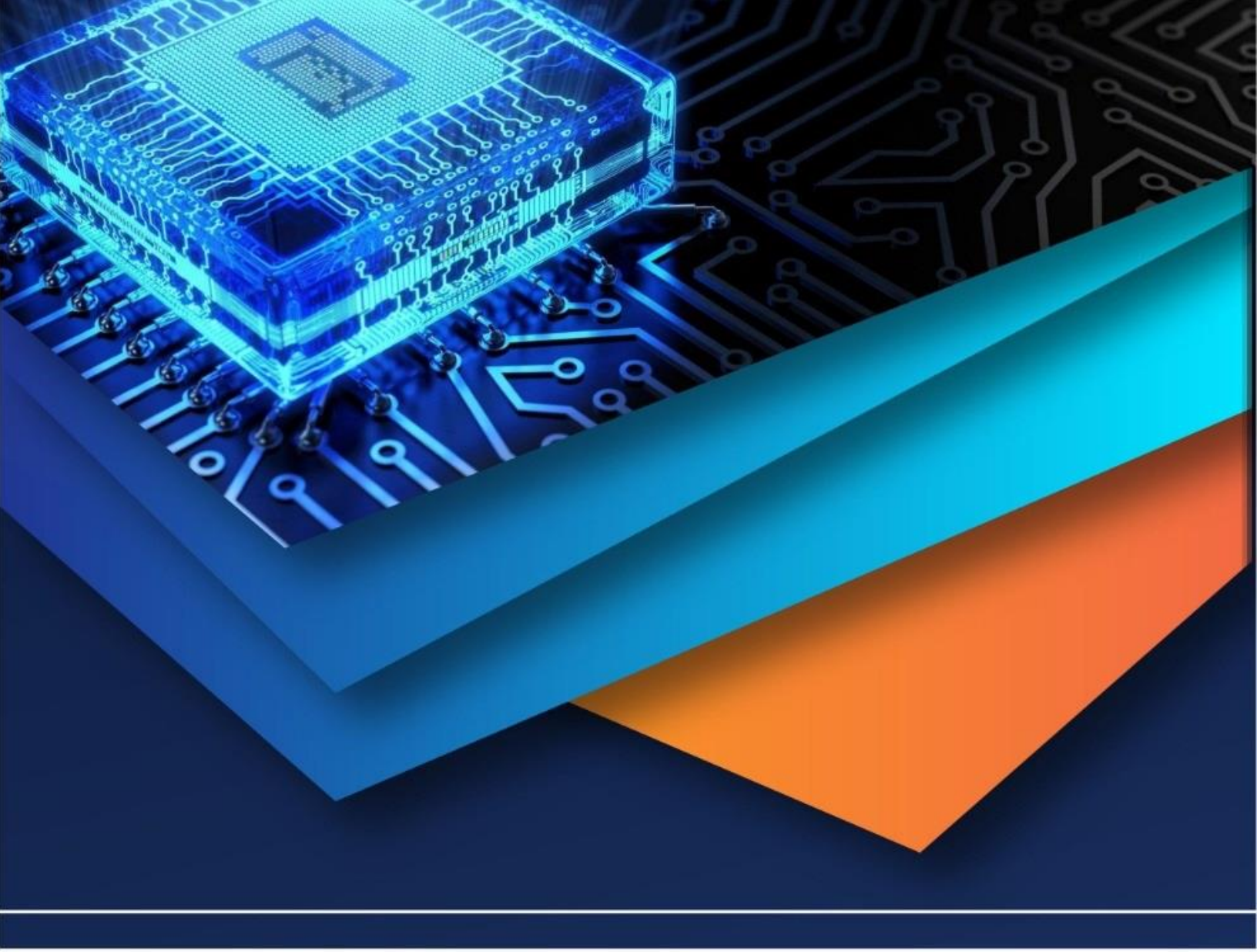

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