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A Accomplished AC/DC Converter with Power Aspect Correction

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Abstract: ***Dc power supplies are significantly used inside most of electrical and electronic home equipment including in computers, televisions, audio sets and others. Power supplies make the burden compatible with its power supply. The presence of nonlinear hundreds consequences into low energy aspect operation of the electricity system. Several techniques for power factor correction and harmonic reduction have been said and a few of them have received more attractiveness over the others. On this paper a bridgeless strength aspect correction raise converter is proposed which results in progressed electricity thing and reduced harmonics content in input line currents as compared to conventional increase converter topology. Bridgeless energy element correction enhance converter eliminates the road- voltage bridge rectifier in traditional boost energy issue correction converter, so that the conduction loss is decreased.***

Keywords: Power Factor Correction (PFC), Conventional Boost converter, Bridgeless PFC Boost converter, Total Harmonic Distortion (THD), Power factor.

I. INTRODUCTION

The extensive use of dc energy elements inside most of electrical and digital appliances result in an growing demand for electricity elements that draw modern-day with low harmonic content material & additionally have power element close to harmony.

Dc strength components are notably used inner maximum of electrical and digital appliances such as in computers, audio sets, televisions, and others. The presence of nonlinear hundreds effects in low strength factor operation of the power system. The simple block in lots of strength digital converters are uncontrolled diode bridge rectifiers with capacitive filter out. Because of the non-linear nature of bridge rectifiers, non-sinusoidal modern-day is drawn from the utility and harmonics are injected into the application strains. The bridge rectifiers make contributions to high THD, low PF, and coffee efficiency to the electricity machine. These harmonic currents motive numerous problems which includes voltage distortion, heating, noises and so on. Which results in decreased performance of the power system? Because of this fact, there's a need for power materials that draw cutting-edge with low harmonic content & additionally have energy component close to solidarity.

The AC mains application supply ideally is supposed to be unfastened from high voltage spikes and cutting-edge harmonics. Discontinuous input contemporary that exists at the AC mains due to the non-linearity of the rectification procedure ought to be formed to follow the sinusoidal form of the input voltage. Energy element correction techniques are of two types – passive and energetic. at the same time as, passive power factor correction techniques are the nice desire for low power, fee sensitive applications, the lively electricity element correction techniques are utilized in majority of the packages because of their superior overall performance.

The non-stop-conduction mode (CCM) traditional improve topology has been broadly used as a % converter due to its simplicity and high strength capability. Currently, so that it will improve the performance of the front-end PF Crectifiers, many electricity deliver manufacturers have started out considering bridgeless electricity element correction circuit topologies. Commonly, the bridgeless percent topologies, also referred to as twin enhance % rectifiers, reduce the conduction loss through reducing the range of semiconductor components within the line current route.

A. Conventional Pfc Boost Converter

The conventional input level for single section power supplies operates by using rectifying the ac line voltage and filtering with large electrolytic capacitors. This technique effects in a distorted input modern waveform with massive harmonic content material. As a result, the power aspect becomes very terrible (round zero.6). The discount of enter cutting-edge harmonics and operation at high strength component (close to solidarity) are essential necessities for suitable power resources. The conventional increase topology is the most widely used topology for electricity element correction packages. It consists of a front-cease full-bridge diode

rectifier observed by means of the raise converter. The diode bridge rectifier is used to rectify the AC enter voltage to DC, that is then given to the boost phase. This approach is right for an extremely low to medium electricity variety applications. For higher energy degrees, the diode bridge turns into an essential part of the software and it's miles vital to deal with the trouble of heat dissipation in limited surface area.

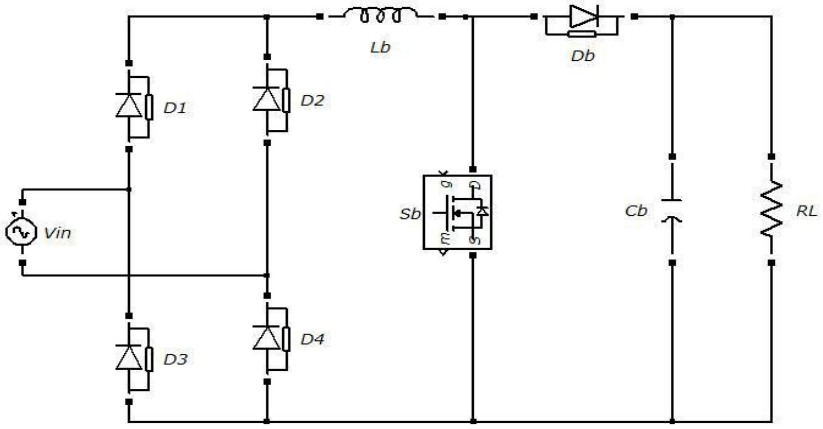

Fig1.Conventionalpfcboost

II. BRIDGELESSPFCBOOSTCONVERTER

The operation of bridgeless strength aspect correction increase converter can be divided into 4 modes. Modes I and II comes under nice half of cycle of enter voltage and modes III and IV comes beneath the poor half of cycle of enter voltage.

Tremendous half of cycle: for the duration of the effective half cycle of the enter voltage, the first dc/dc increase circuit, LB1-D1–S1 is active thru diode D4. Diode D4 connects the ac source to the output floor. The high quality half cycle operation can be divided into modes (Mode I and Mode II).

During mode operation, the switch S1 is in on condition. When switch S1turnson, inductor LB1 stores energy through the path Vin-LB1-S1-D4.

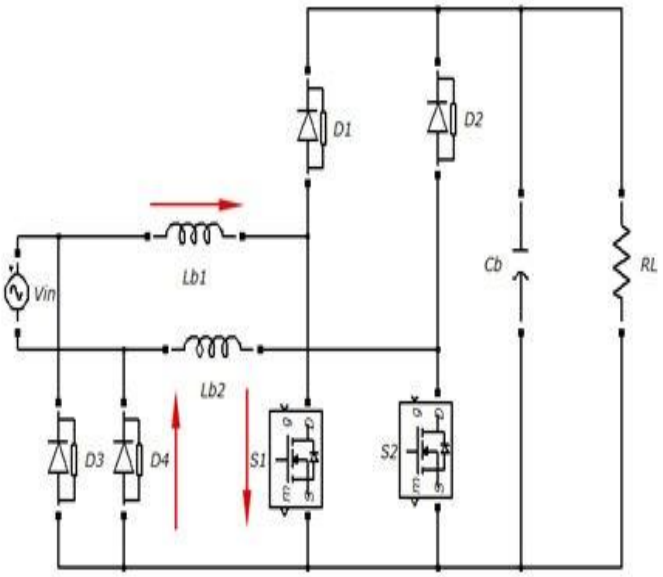

Fig.3(a)ModeIoperation

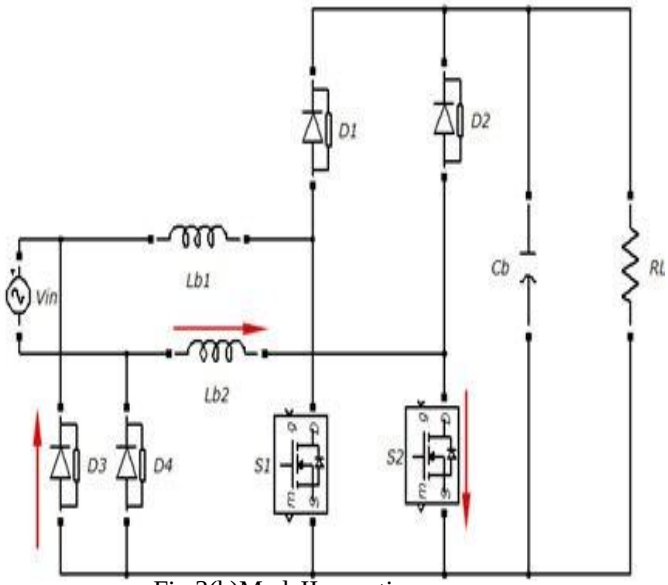

Fig.3(b)ModeIIoperation

During mode II operation, the switch S1 is in off condition. When switch S1 turns off, the energy stored in the inductor LB1 gets discharged and the current flows through diode D1, load RL, and returns back to the mains through the diode D4.

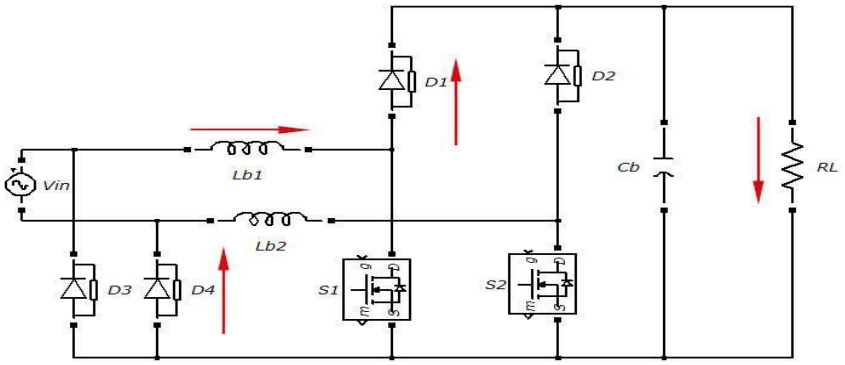

Fig.3(c) Mode III operation

direction Vin-LB2-S2-D3.N For the duration of mode IV operation, the switch S2 is in off condition. When transfer S2 turns off, the electricity saved in the inductor LB2 receives discharged and the cutting-edge flows through diode D2, load RL, and returns to the mains thru the diode D3.

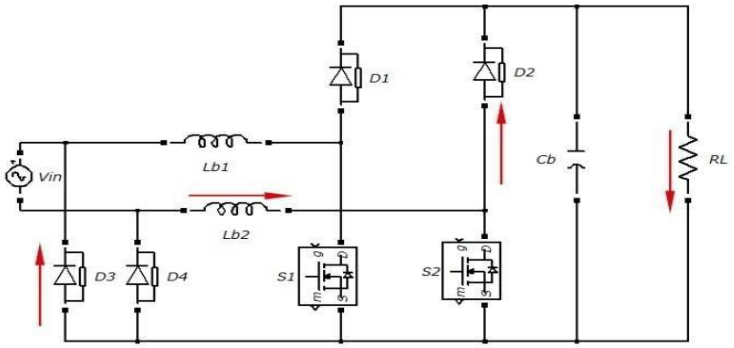

Fig.3(d)Mode IV operation

III. SIMULATION AND RESULTS

The computer simulation of conventional power factor correction boost rectifier and proposed bridgeless PFC boost converter redone using Matlab Simulink and the results are presented.

A. Conventional PFC Boost Rectifier

Simulation circuit of conventional PFC boost rectifier is shown in Figure 4(a).

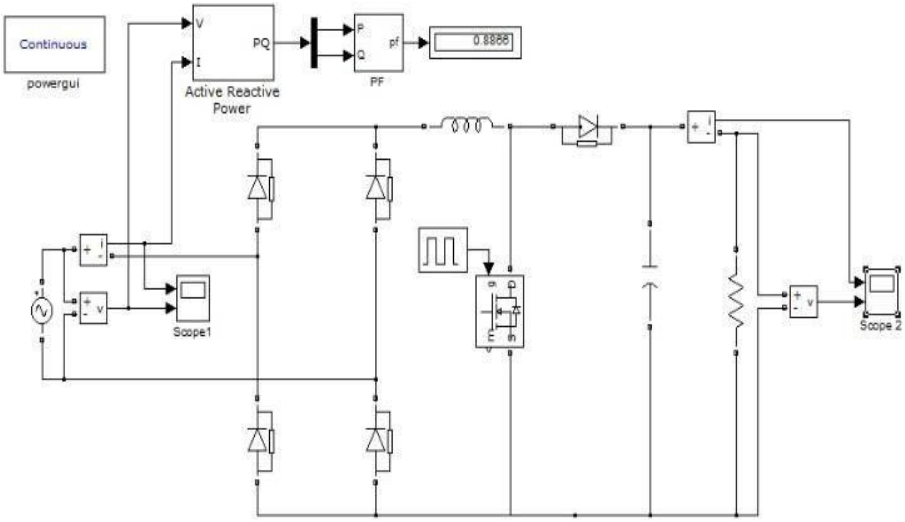

Fig.4(a)Simulation of Boost Converter

Simulated line voltage and line current wave forms of conventional PFC boost rectifier operating at 230-Vrms line voltage are shown in figure 4(b). The power factor is obtained as 0.8866. Figure4(c)shows the FFT analysis of input current wave form.

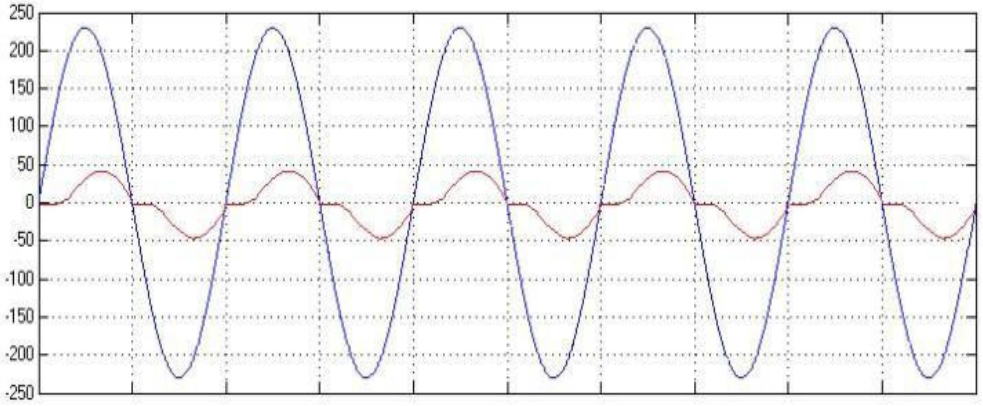

Fig 4(b) Input voltage and input current wave form

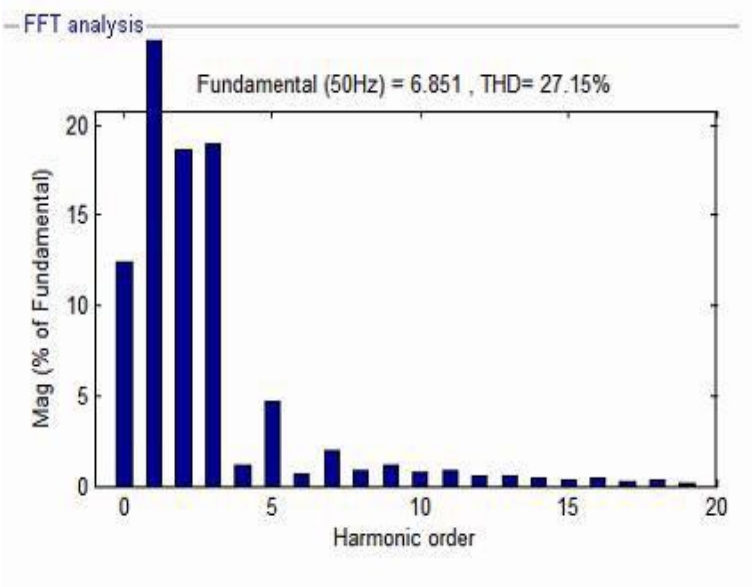

Fig.4(c)FFT analysis of input current wave form

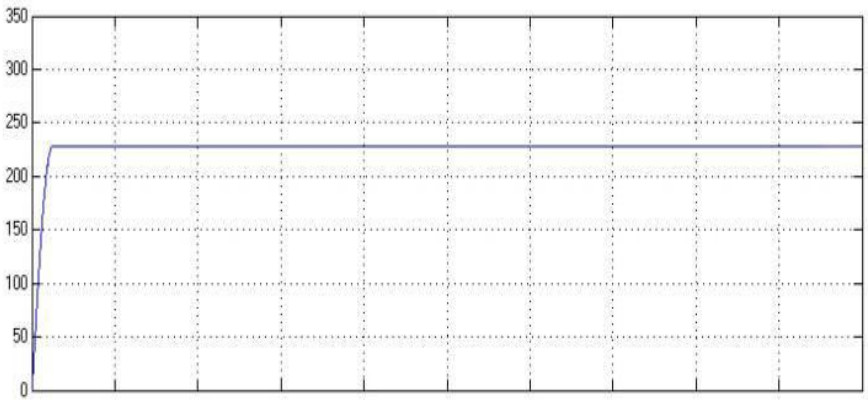

Fig.4(d)Simulation of Bridgeless PFC Boost Converter

IV. BRIDGELESS PFCBOOST CONVERTER

Simulation circuit of bridgeless PFC boost converter is shown in Fig.4 (d). The controlled switch implemented is the power MOSFET which has in herentlys low body diode.

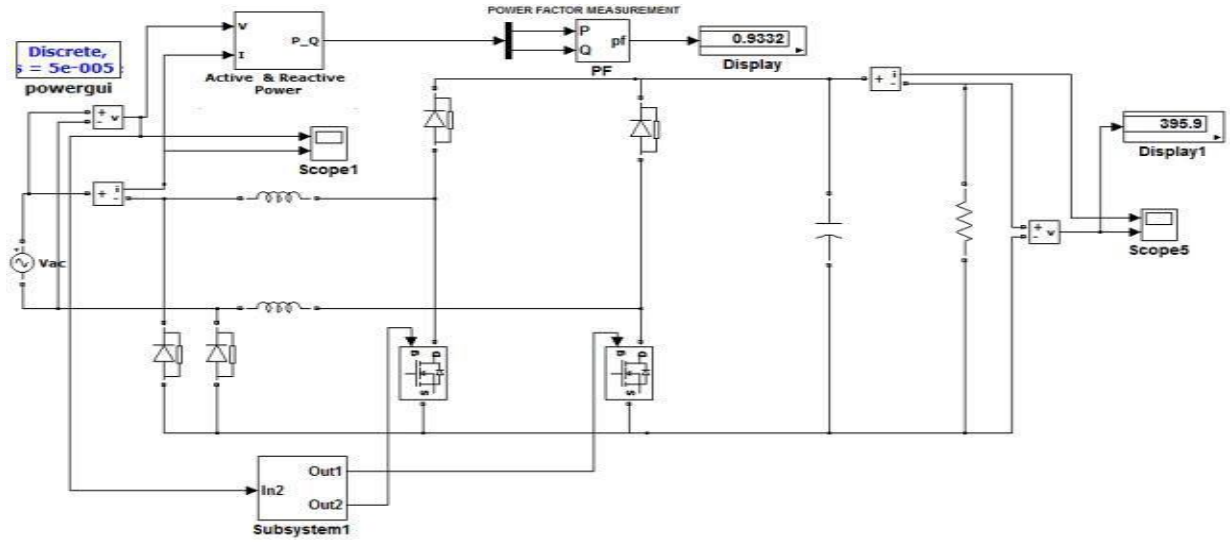

Fig4(e) Input voltage and input current wave form

Simulated line voltage and line current wave forms of bridgeless PFC boost rectifier operating at230-Vrmsline voltage are shown in figure 4(e). The output voltage wave for miss how n in figure4 (f). FFT analysis of input current wave for miss how n in figure 4(f). The THD percentage obtained in the simulation is <10% and the power factor is obtained as 0.9332

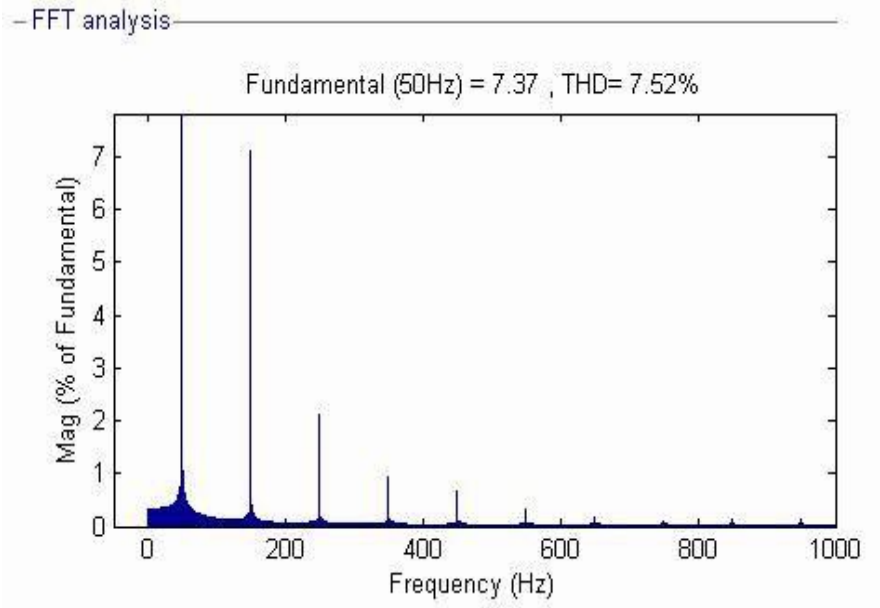

Fig.4(f)Output voltage wave form

V. CONCLUSIONS

A single-phase Bridgeless PFC boost Converter is modeled and simulated using Matlab. in comparison to the traditional PFC boost p.c raise converter, the bridgeless PFC boost converter, also referred to as the dual-boost PFC rectifiers, commonly, improves the performance of the front quit percent stage by removing one diode ahead- voltage drop inside the line-present day route. The Bridgeless PFC boost Converter gives an awesome option to enforce low price excessive strength thing AC–DC converters with speedy output regulation

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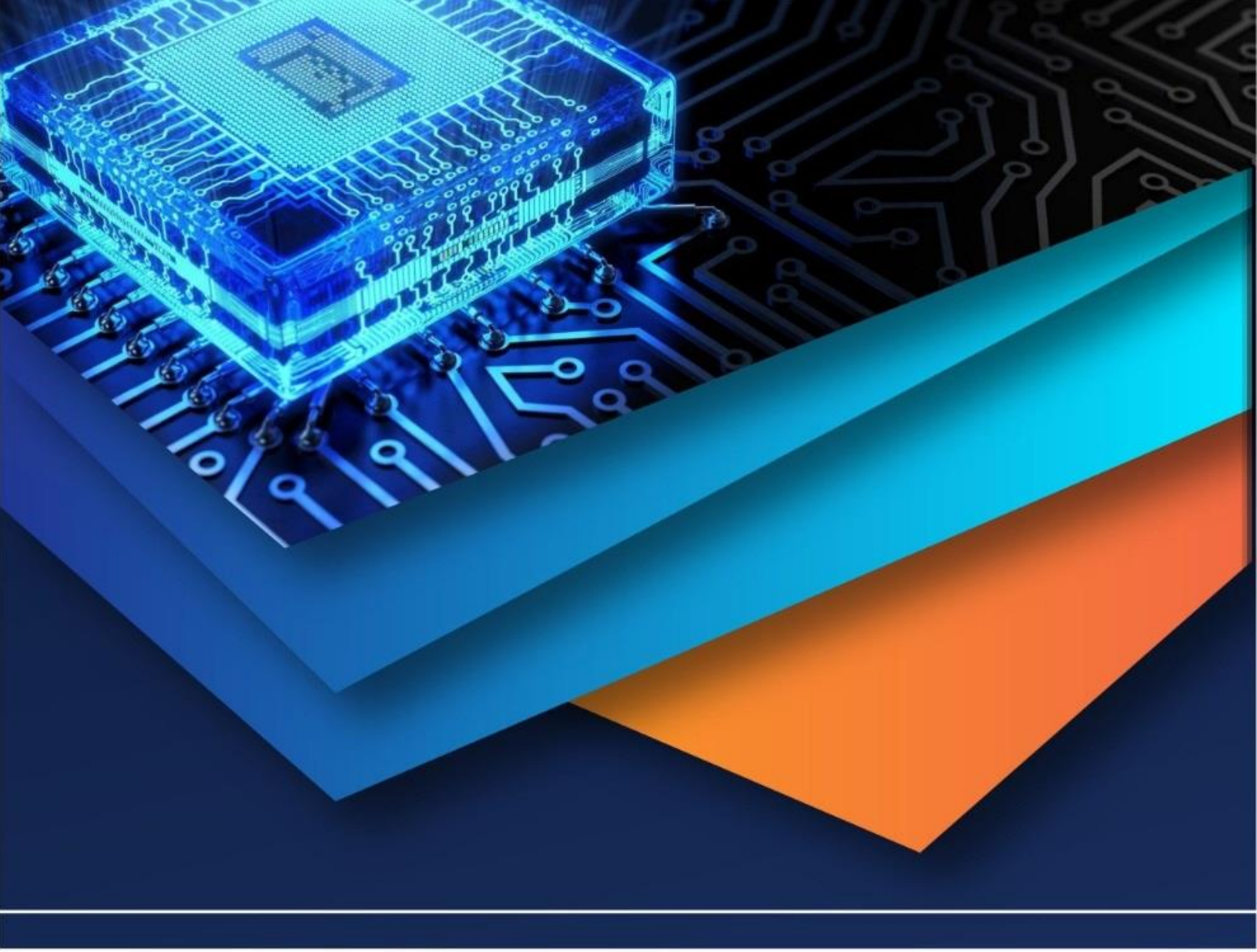

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