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# Effect of Air Entertainment Using Olive Oil on Properties of Concrete

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***Abstract: Air entrained concrete can be produced by introducing suitable air-entraining agent, one such commonly available material in India is Olive Oil which is being used in my experimental work. The primary objective of this study to find the appropriate amount of Olive Oil for strength and density, water absorption, other properties of concrete. For which the amount of Olive oil is varied from 0 %, 2%, 4%, and 6% Olive Oil by weight of 100 kg of cement. The test which was carried out in the experimental work were density, workability, strength, water absorption, the slump of air-entrained concrete. Total 48 No. of the concrete cube was cast for the experimental work. The result of the experiment work shows if Olive Oil is used in the range of 5-6% it will provide better workability, less water absorption with acceptable 5-7% decrease in compressive strength.***

## I. INTRODUCTION

Concrete is second in the list of most consumed material in the present generation, just after water. So research in the field of concrete having a great scope in the 21st century. Concrete is not only used for building works but also used in roads, airports, dams, almost every construction work. It is used in a maximum amount in comparison to other construction material. So basis aim of every researcher is to make it more and more environmentally friendly and also make it suitable for every environmental condition whether it is underwater, cold areas or hot environment so that maximum use of this material can be obtained, but at present it has various limitation in its use like in cold area it has problem of freeze and thaw, in underwater it get wash away with water. So some advancement and use of the new technique will always be appreciated in concrete. Moreover constituent of concrete-like gravel, sand, cement, water are available in the nature in limited amount because it takes a lot of time to the formation of these materials so it will be better if we can replace or reduce the quantity of its constituent that is being used nowadays so that the next generation will also get benefited by these resources. Overall sustainable development should be kept in mind while using these resources. Although concrete is being used from the past several decades still day by day it is witnessing some advancement. One such advancement is a topic of my dissertation work and detail report of that is presented below.

## II. LITERATURE REVIEW

The various research paper has been published until now on air-entraining admixture but mostly on other material. only a few of them belong to Olive Oil but results of this presented in the form of air content, so it is essential to have exact knowledge about quantity of Olive Oil and corresponding advantage for better understanding. Some of the literature reviews, I found useful for my purpose so these are listed below.

## III. REVIEW ON AIR ENTRAINED CONCRETE OF PREVIOUS STUDIES

*1) " Experimental Evaluation of Black Olive oil as Water Repellent Admixture in Concrete"*

Ogbo E. Happiness, Onuegbu.O. Ugwu, Tarzomon. T. Thaddeus

The effect of Black Olive Oil (BLO) on the properties of concrete was investigated in five different proportions of 0%, 0.3%, 0.5%, 0.7% and 1.0% by weight of cement binder. Addition of BLO showed to have different effect on the properties of the fresh and harden cement paste depending on the amount of BLO added. Transport properties measured in terms of water absorption, sorptivity and coefficient of water permeability were improved greatly with the addition of BLO in the concrete, however; the mechanical properties were slightly compromised. The Oil addition into cement matrix was found to be significantly decreasing the amount of pores which are easily accessible to water. This was affirmed by the clear lower total porosity valve of BLO/OPC concrete mixes compared to the plain OPC conventional mixes. The observed performance of BLO addition in improving the permeability properties of concrete mixes investigated indicates that the durability of concrete may be improved; as a consequence of reduced water absorption induced, the rate of detrimental reactions needing liquid as a reaction medium is reduced. Also, the ingress of water born aggressive such as chloride

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*2) "A Critical Appraisal of the Airentrainment in Concrete"*
(Sakshi Gupta, Ankit Batra)
Air-entrained concrete is the conventional concrete which contains controlled amounts of air in the form of microscopic bubbles added intentionally in the concrete. Some results related to air entrainment concrete remain fruitful for future aspects; other makes the use of AEA‟s to be a troublesome issue. While enumerating the advantages of this review study, the noticeable change in workability has been noticed and shortened time and vibrations for proper consolidation. Use of AEA‟s also reduced the amount of cement and water as well.

*3) Strength Characteristics of Air Entrained Concrete*
**(**Giridhar V, Prathap Kumar N. and Suresh Praveen Kumar)
Present paper emphasizes on the strength characteristics of air entrained concrete using admixtures. The main function of air entrained agent is to increase the workability of fresh concrete, and durability of hardened concrete. For this purpose, three different air entrained agents are used in the concrete preparation those are Olive Oil, Oleic Acid, and Hydrogen Peroxide. The dosage of admixtures is chosen in the concrete production as 0%, 0.5%, 1% and 1.5% by weight of cement. By adding admixtures into the concrete, Workability of fresh concrete has been increased and strength of the concrete decreased.

*4) " Response of air-entrained concrete to severe chemical aggression"*
Safwan A. Khedr, M. ASCE; MOHAMED Nagib abou-zeid; and jane M. abadir (2006)
The author studied the effect of air-entrained concrete subjected to some chemicals for that sample were subjected to abrasion testing, exposed to sulphuric acid, calcium chloride, and ammonium sulphate. The outcome of experimental work suggests that for good workability, air-entrained concrete with adequate strength and abrasion resistance, quite low permeability and better chemical resistance possible.

| S no | Authour | Journal | Material | Results |
|---|---|---|---|---|
| 1 | Khedar S.A. | ASCE 2006 | Aea Wood Resin Based (1% to 7%) air content | 80% Increase in Chemical Disintegration Factor in Sulfuric Acid At 5-7 % Of Air Content.<br><br>5% Strength Decrease Due To 5-6 % Of Air Content |

*5) "Effect of sodium sulphate and sodium nitrite on the air-void system in air-entrained concrete"*
( Qinfei li, yong ge, and wencui yang)
In this paper foam index test indicated that the introduction of either sodium sulphate or sodium nitrite results in a drop in foaming power, but has no effect on foam stability. The addition of sodium salt was found to lead to a decrease in the pore size of air voids in air-entrained concrete. Adding sodium sulphate in conjunction with sodium abietate was found to gradually increase the Powers spacing factor, while the corresponding results for sodium nitrite were the reverse.

*6) "Freeze-Thaw Durability of Air-Entrained Concrete"*
(Huai-Shuai Shang and Ting-Hua Yi)
The freeze-thaw durability of plain concrete is poor, but it can be enhanced by some amount when the air-entraining agent is blended into the concrete. It shows that ordinary-strength concrete can also have good freeze-thaw durability.

| S NO | AUTHOUR | JOURNAL | MATERIAL | RESULTS |
|---|---|---|---|---|
| 4 | Zhang Jian | ASCE 2013 (Technical note) | Directly Air 4-5 % Mentioned Reinforced AEC Used | Freeze And Thaw Resistance Increases |

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## IV. MATERIAL & METHODLOGY

Objective of Experimental Programme is to find out the effectiveness of Olive oil and its amount for getting the proper advantage of this material. Here Olive oil used with 4 different amount 0%, 2%, 4% and 6% and various properties of concrete studied and Proper correlation determined with varying amount of Olive oil and properties of concrete. In this chapter detail of test conducted on the material which is used in cube preparation and casting is briefly mentioned and also test performed in a cube is mentioned.

### *A. Methodology*

*1)* Collection & Testing of material physical properties
*2)* Trial % of olive oil in mortar cube
*3)* Mix design (M30) & casting of the cube
*4)* Workability determination
*5)* Compressive strength found at 7, 14, 28 days
*6)* Water absorption found
*7)* Density determination

## V. RESULT AND DISCUSSION

### *A. Introduction*

This chapter consist result of Compressive strength, Water Absorption, Density, Slump value with varying Olive oil 0%, 2%, 4%, 6%. The value is provided in table and graph form for easy understanding the short procedure of test also written along with it.

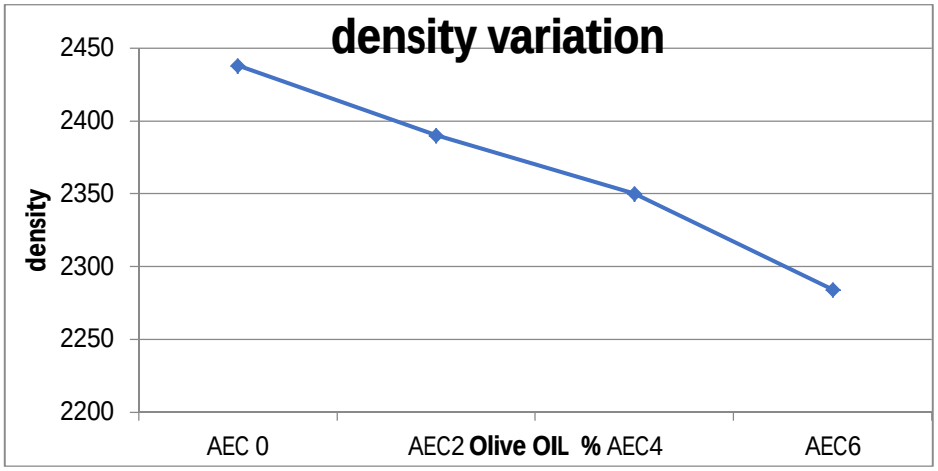
### *B. Density Variation (Hardened Concrete BS12390-7;2003*

Density is defined as weight divided by the volume of the cube. volume of concrete cube is known 150mmx150mmx150mm = 3375cm$^3$. The volume of concrete is already known the only weight of concrete is taken after 28 days than weight divided by volume gives the density of concrete lesser the value indicates lighter the cube.

(Table4.1)

| Specimen | Weight (kg) | Volume(cm$^3$) | Density (kg/ m$^3$) | % Reduction w.r.t to AEC 0 |
|---|---|---|---|---|
| AEC-0 | 8.22 | 3375cm3 | 2438 | - |
| AEC-2 | 8.066 | 3375cm$^3$ | 2390 | 1.96% |
| AEC-4 | 7.93 | 3375cm$^3$ | 2350 | 3.6% |
| AEC-6 | 7.70 | 3375cm$^3$ | 2284 | 6.31% |

Graph 4.1

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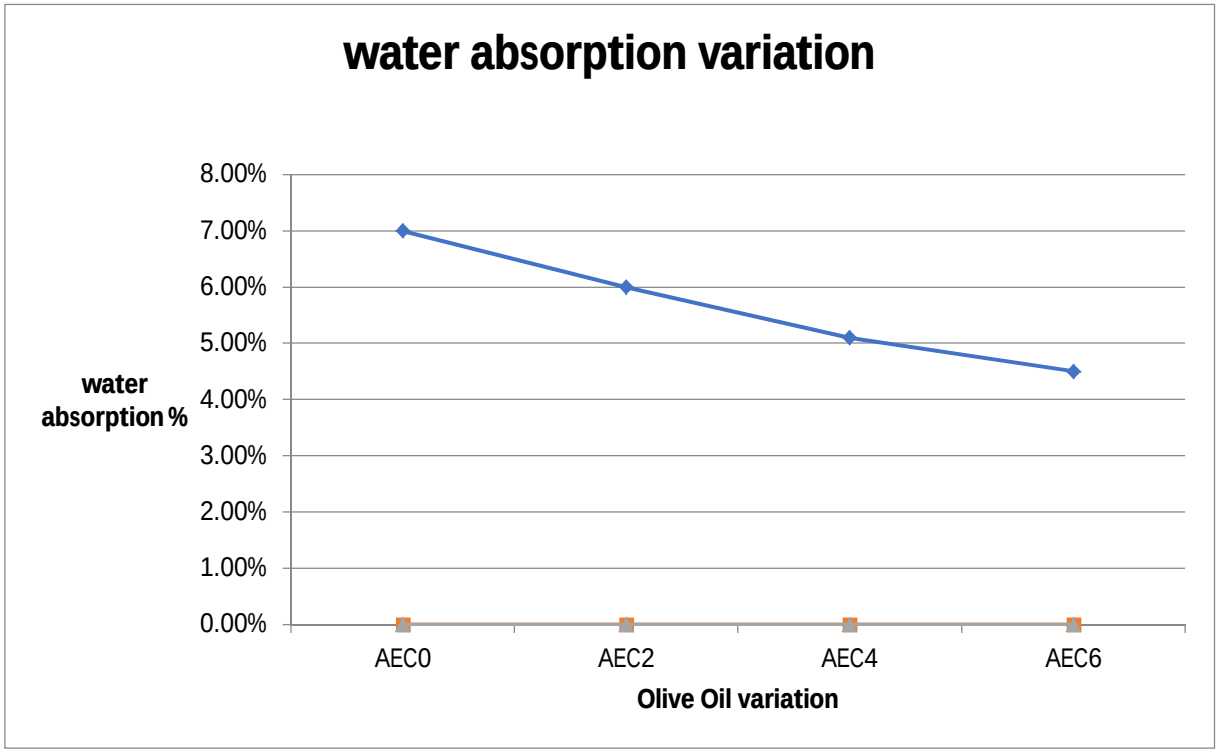
*C. Water Absorption (BS1881-122-1983/11 )*

It is defined as the weight of water divided by dry weight of concrete. It is determined for 28 days and it shows the durability property of concrete cube. This is a very simple test and lesser the value of this indicate the better the cube sample.(table 4.2)

| S.NO. | SPECIMEN | DRY WT. (kg) | WET WT.(kg) | WATER ABSORPTION% |
|---|---|---|---|---|
| 1. | AEC-0 | 8.300 | 8.900 | 7.22% |
| 2. | AEC-2 | 8.066 | 8.55 | 6% |
| 3. | AEC-4 | 7.76 | 8.155 | 5.1% |
| 4 | AEC-6 | 7.43 | 7.76 | 4.5% |




(Graph 4.2)

*D. Workability (IS1199-1959)*

Workability of air-entrained concrete measured by slump method. Mix is prepared and slump instrument is placed in levelled surface and mix is filled in three layers each layer is tempted for 25 times with 16mm steel rod and when mould is filled its top surface is stuck off and make is levelled and then mould is lifted vertically, slowly and carefully now height is measured and decrease in length is called slump and this decrease in length is reported.

(Table 4.3)

| S.No. | Specimen | Slump(mm) |
|---|---|---|
| 1. | AEC-0 | 45 |
| 2. | AEC-2 | 50 |
| 3. | AEC-4 | 70 |
| 4. | AEC-6 | 85 |

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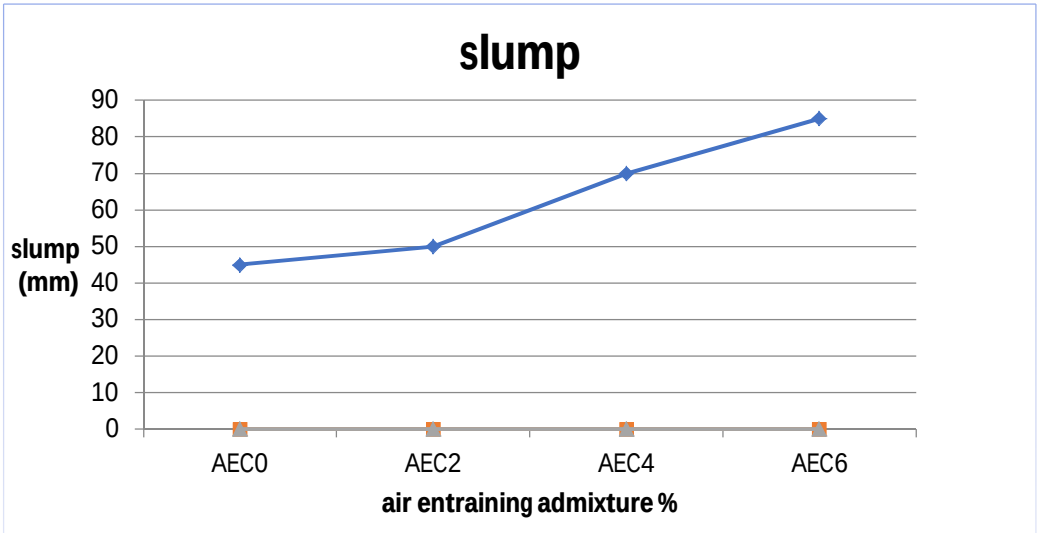



(Graph 4.3)

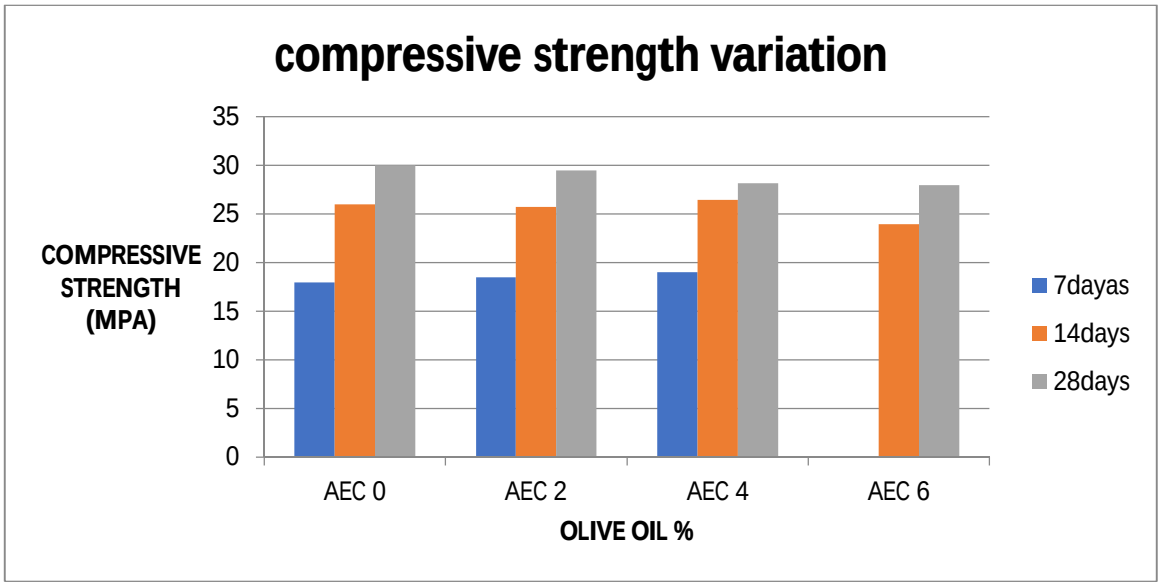
*E. Compressive Strength OF AEC (in MPA) (IS 516-1959)*

Load per unit area that concrete can bear is known as compressive strength. It depends upon the type of concrete mix which varies from M20 to M60 where 20 or 60 is the characteristic strength of concrete. Cube of size 150mmx150mmx150 mm is prepared and then after the 24-hour mould is removed and the cube is put in curing tank for desired period i.e. 7 days, 14 days, 28 days the cube is left for air drying then tested in compression testing machine. After cube is wiped out**,** dimension of cube taken and put this in compression testing machine and load is gradually applied at the rate of 140 kg/cm2 till the specimen shows failure and load at which failure occurs is noted down then load value is divided by area value of specimen gives the value of compressive strength of specimen for the desired period .

Table 4.4

| S.No. | Specimen | 7 days | 14 days | 28 days |
|---|---|---|---|---|
| 1. | AEC-0 | 18 | 26 | 30 |
| 2. | AEC-2 | 18.5 | 25.75 | 29.5 |
| 3. | AEC-4 | 19 | 26.50 | 28.20 |
| 4. | AEC-6 | - | 24 | 28 |

Graph4.4

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## VI. CONCLUSION

Following conclusion are drawn from present research work

*1)* The density of concrete is gradually decreasing as Olive oil content increases but the decrease is not very significant as in case of lightweight concrete.
*2)* Water absorption decreases as Olive oil content increases.
*3)* Workability of concrete considerably increases as Olive Oil content increases.
*4)* Compressive strength Decreases a as the percentage of Olive Oil content increases.

### *A. Future Scope of Work*

*1)* Comparative study can be made with other Air entraining agent
*2)* Some other strength and durability parameter of Concrete can be Investigated.
*3)* Air content of fresh and hardened concrete can be determined.

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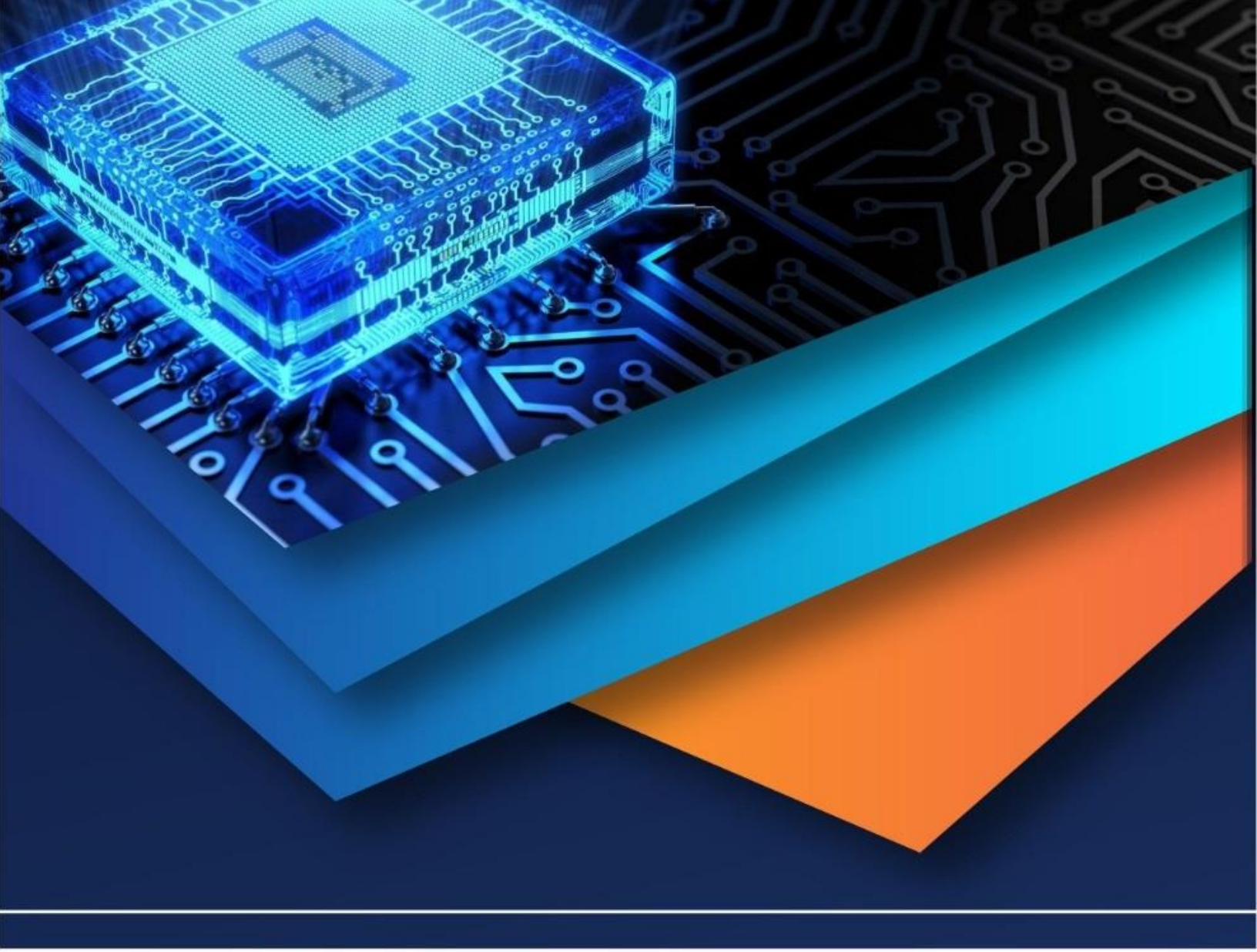

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