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Effect of Waste Tyre Chips on Road Construction

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Abstract: Tire chips alone or mixed with sand/clayey soil have been investigated extensively for engg. properties, shear strength , energy absorption capacity. These are basically used in a leachate collection layer and they have the capability of protecting the underlying liner system. Grey and Lin in 1972 reported that both the rate of gain in strength and the ultimate strength of lime treated fly ash were sensitive to curing temperature. Eades and Grim (1960) raised the question regarding longevity of lime stabilised material as leaching of lime from the matrix could create a problem. Ghosh and Subbarao (2001) reported that addition of 1% Gypsum along with 10% lime to the flyash enhanced the UCS by 36.7 times. This was due to catalytic effect of gypsum on the reaction and flyash + lime reaction. The addition of small percentage of gypsum (0.5 to 1%) to fly ash+ lime mixture increase the strength of compacted specimen at lower curing period (7 days) compared to only lime stabilised mixes. But the contribution of gypsum is significant for curing.
Keywords: Absorption, Chips, Longrvity, Compacted, Leaching.

I. INTRODUCTION

The quantities of wastes that are accumulating in developed and developing countries are causing disposal problems that are both financially and environmentally expensive. One method to reduce some portion of the waste disposal problem is by utilising these waste materials for engineering purposes. In India, there is extensive road network which is under construction so there is scarcity of conventional construction material. In order to meet the growing need of scarce construction materials, waste materials are now being used in some of the road projects. The present work is one such attempt to examine the effect of waste tire chips on UCS of FA+LIME+GYPSUM mixture. The results obtained from the tests are presented and discussed here in this report.

II. OBJECTIVE OF THIS STUDY

This research aimed at finding the most beneficial way of reusing the waste tyres through ground improvement which will contribute to sustainable development. The study was carried out to investigate the effect of shredded waste tyres on shear strength when randomly mixed with selected sandy soils of South Africa. The specific objectives are summarized below.

A. Undertake laboratory characterization of the soil and tyre shreds materials.
B. Appraise the effect of varying concentration of tyre shreds on shear strength parameters of sand.
C. Determine the effect of varying sizes on shear strength parameters of sand.
D. Evaluate the effect of varying tyre shred content on shear strength of sand.
E. Compare the overall shear strength results from the investigated tyre shred sizes.

III. LITERATURE REVIEW

Bernal (1996) conducted intensive literature review of the laboratory studies on tire shreds and tire chips. Humphrey et al. (1993), Foose etal. (1996), and Gebhardt (1997) conducted independent direct shear tests on tire shreds in large-size shear machines. The sizes of the materials they tested varied from 38 mm to 1400 mm. Using peak shear stress or, stress at a horizontal displacement equal to 10% or 9% of the length of the shear box If no peak stress is observed.

Bressette (1984), Ahmed (1993), Benda (1995), Masad etal. (1996), Wu at al. (1997) and Lee et al. (1999) conducted independent triaxial tests on tire chips. The sizes of the materials they tested were from 2mm to 38mm. All the tests were conducted at a compression loading mode except Wu et al. (1997), which conducted compression unloading tests. A linear stress-strain response was observed from all compression loading tests.. K. C. Panda et al (2012) studied the use of scrap tyre rubber in the preparation of concrete has been thought as an alternative disposal of such waste to protect the environment. In this study an attempt has been made to identify the various properties necessary for the design of concrete mix with the coarse tyre rubber chips as aggregate in a systematic manner.

Kotresh K.M and MesfinGetahunBelachew (2014) In this specific circumstance, our present examination plans to explore the ideal utilization of waste tire elastic as coarse aggregates in solid composite. .

Khalid BattalNajim, (2007)[3] study the uses of chopped worn-out tires as a replacement material to production special types of concrete. In presented work, the worn-out tires were used as fibers which have dimensions of 1×1×3 cm. The fibers used as a partial replacement from volume of coarse aggregate. Two mixes of fiber worn-out tires (F.W.T.)

M.A. Aiello&F. Leuzzi (2010) The fundamental target of this paper is to research the properties of different solid blends at new and solidified state, acquired by an incomplete substitution of coarse and fine aggregate with various volume rates of waste tires elasti particles, having similar measurements of the supplanted aggregate.

IV. RESULTS

Results are presented in the form of following table which gives the proving ring value for the 3 kinds of specimen i.e. one having FA+Lime+Gypsum with 7 days curing , second having FA+Lime+Gypsum with 28 days curing, and third having FA+Lime+Gypsum+RS with 7 days curing.

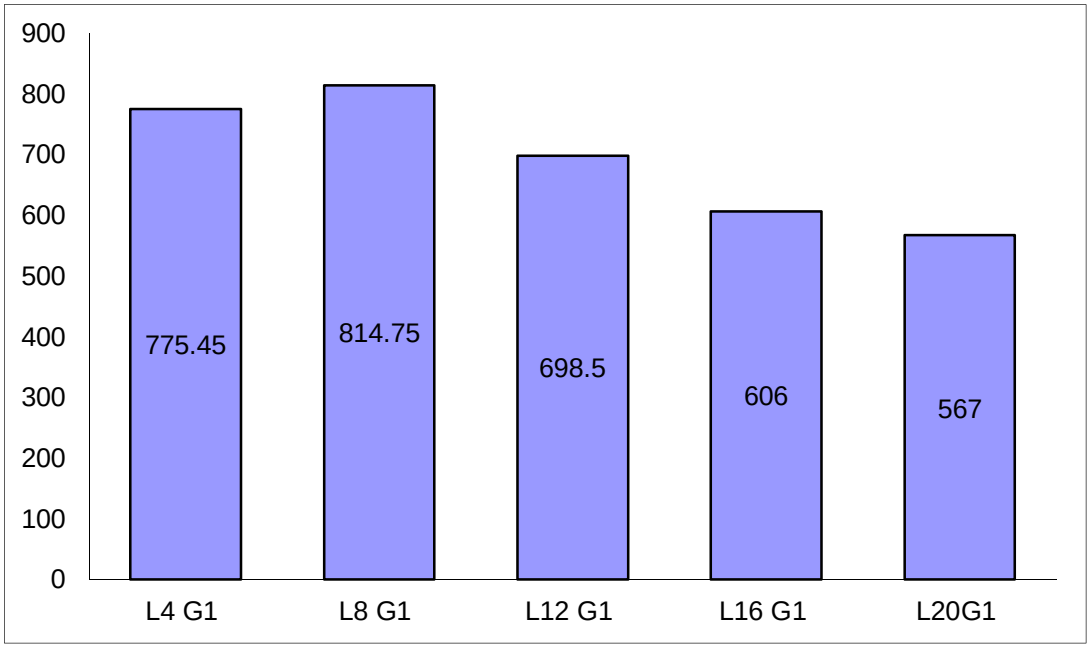

FIG 4.1- For FA+Lime+Gypsum Mix (7DAYS)

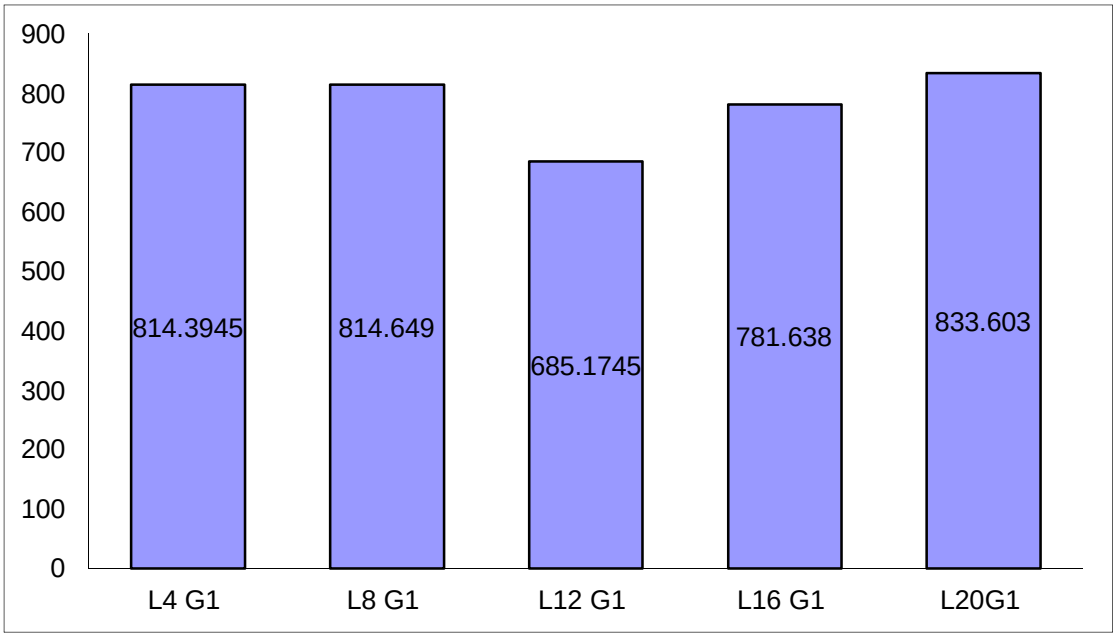

FIG 4.2-For FA+ Lime + Gypsum (28 days curing)

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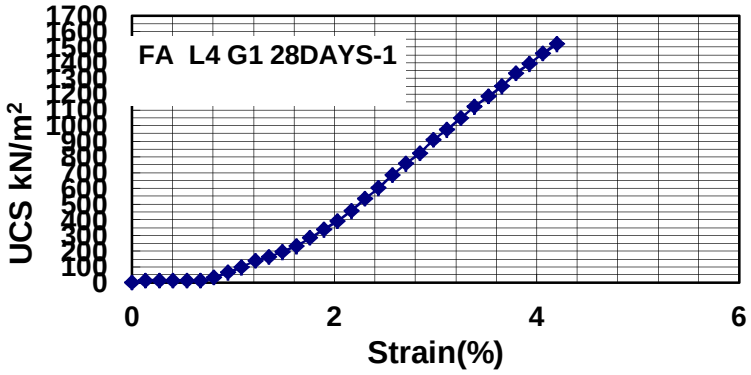
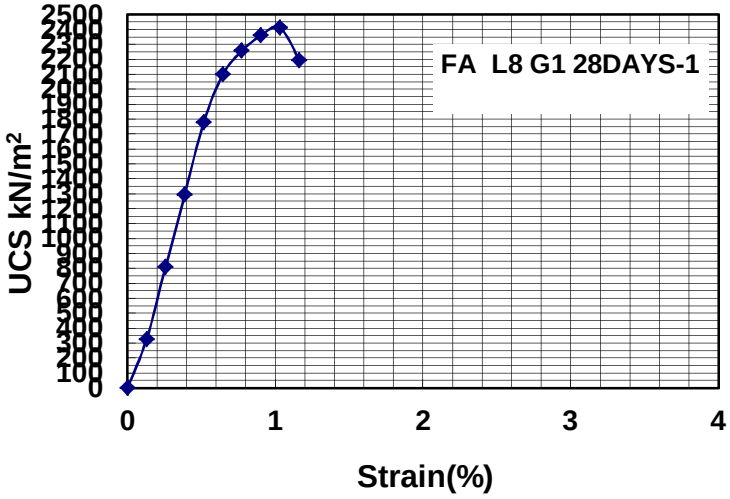
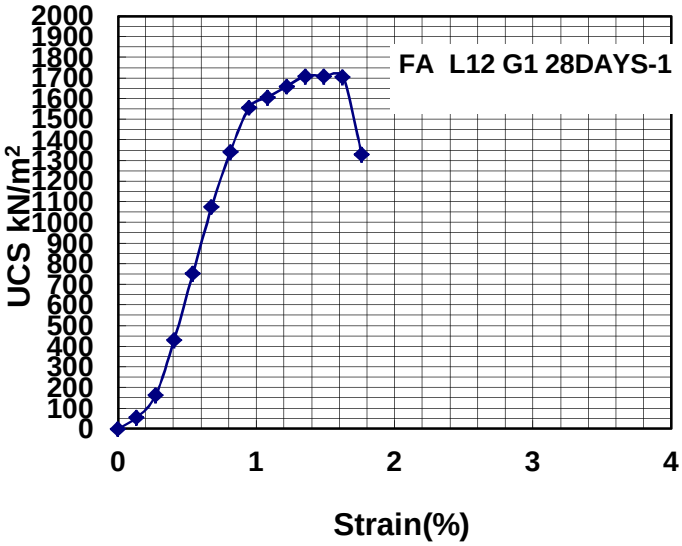


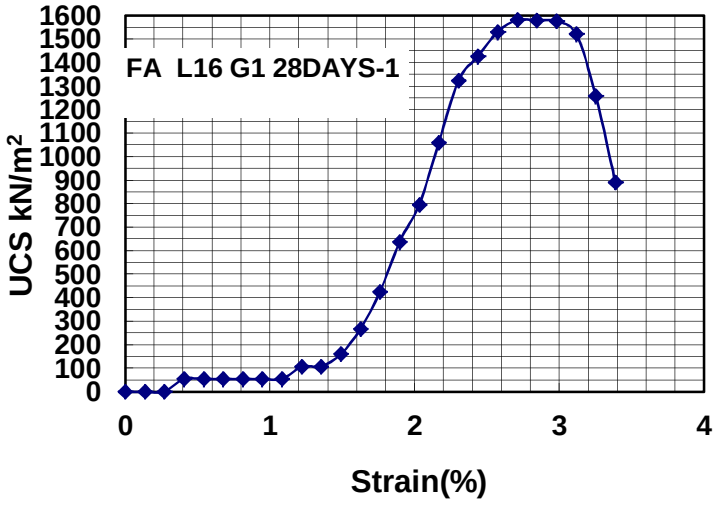
(Fig A)



(Fig B)



(FIG C)



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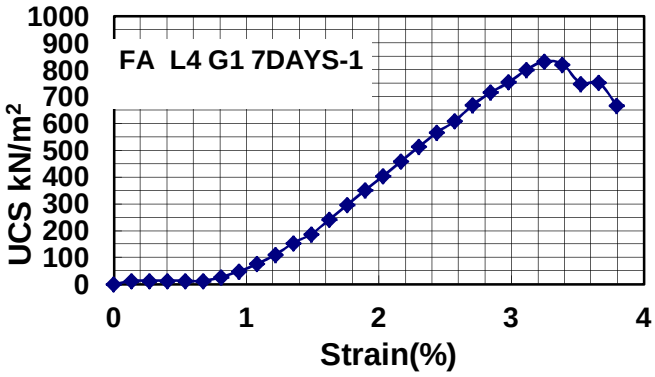
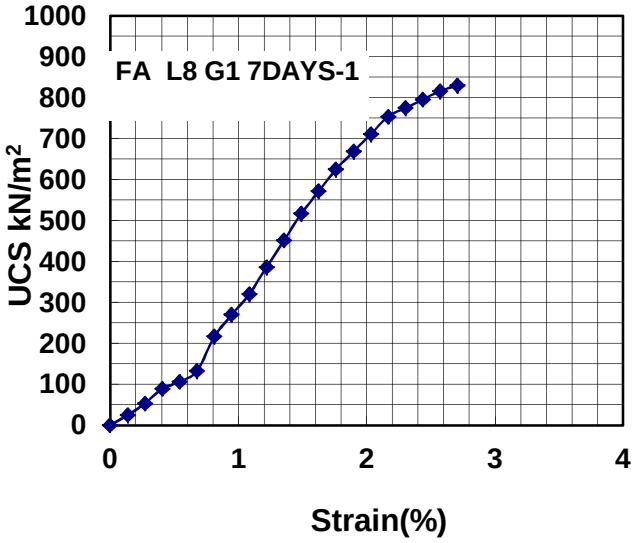


(FIG E)



(Fig F)

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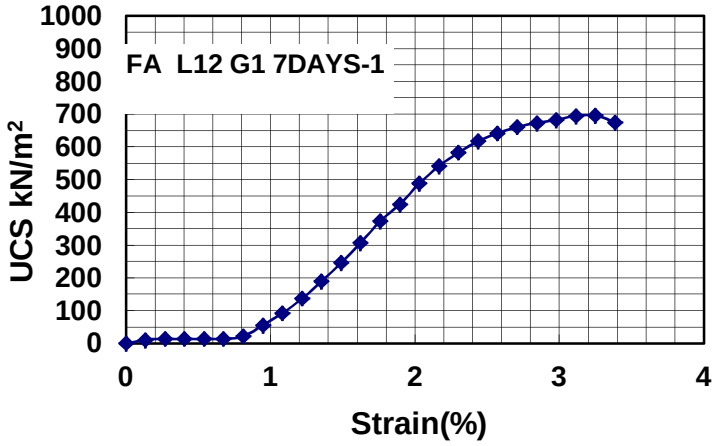
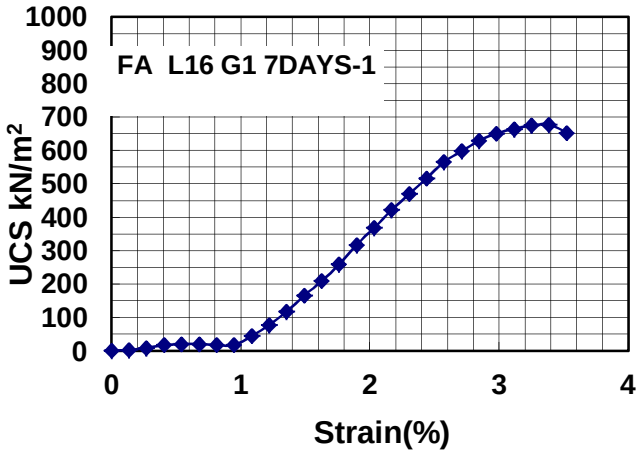
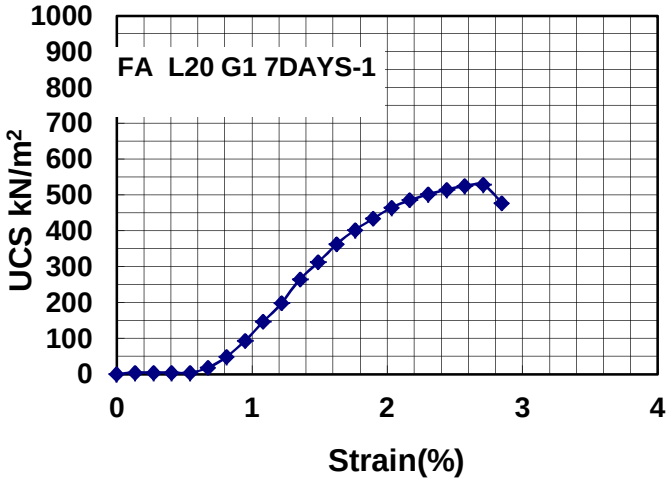


(FIG G)



(Fig H)



(Fig I)

fig 4.3- fig a to i show the stress strain curve for diffrent 7 and 28 days

V. CONCLUSION

After conducting the UCS tests on the prepared samples, the main conclusions which can be drawn by seeing the results are as follows:

A. The optimum mix for the Fly Ash + Lime +Gypsum mixture is Lime = 8%, Gypsum = 1%. Having a lime percentage more than 8% results in decrease in strength.

B. When tire shreds are added to the above mixture, there is an increase in strength which shows addition of tire chips could be an advantageous move for light traffic on soft sub grade construction.

C. When we compare the 7 days cured sample strength with the 28 days cured strength, we found that there is a tremendous increase in the strength in the samples with 28 days curing thereby implying that curing plays an important role in gaining the strength.

D. The specimen containing wet tire chip content 5% were observed to fail by development of multiple cracking.

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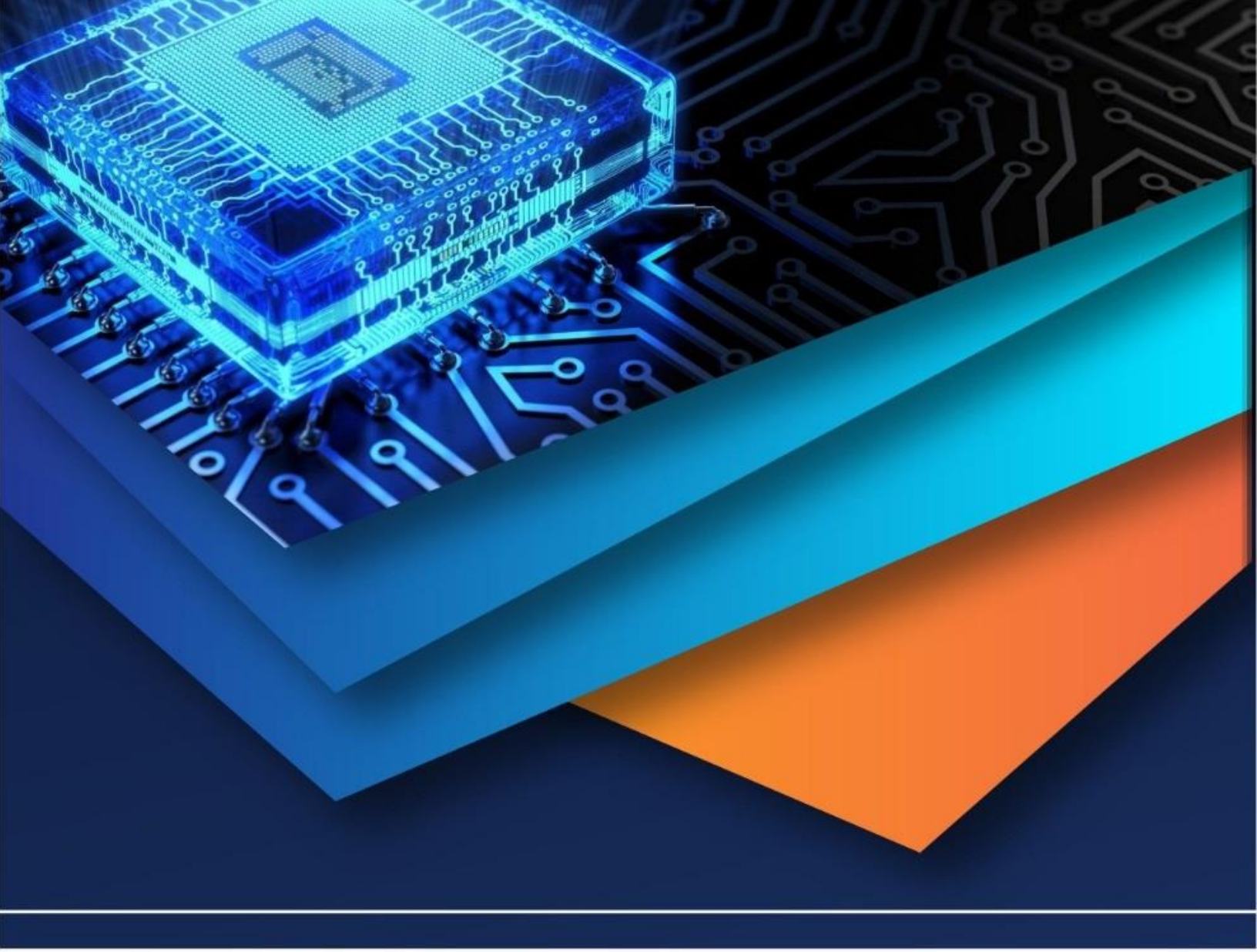

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