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XYZ Analysis for Inventory Management – Case Study of Steel Plant

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Abstract: ***An inventory management is technique which is generally used to manage the organization effectively. The organization wants to control their inventory cost, material cost, labor cost etc. There are several inventory techniques used in organization such as XYZ, ABC, HML, VED and S-OS. In this study we shall focus on XYZ analysis. In XYZ analysis the items are classified into X, Y and Z classes based on unit demand variability. The variability of items is measured by the coefficient of variation (CV) Data collection is mainly of 3 months through the general store manager and other staff involved in inventory control operation of steel plant.***
Key Words: XYZ analysis, inventory management, inventory control.

I. INTRODUCTION

"Reference shows, In any industry today inventory optimization is such a vital function. Excess and Shortage of inventory in all levels of the supply chain can affect the availability of products and/or services to consumers. Several monitoring systems and processes can be employed to check inventory imbalances to minimize the supply and demand dynamics. To simply these monitoring systems and process items/materials/products are classified into different groups".
"Reference shows, Effective inventory Management has played an important role in the success of supply chain management. For organizations that maintain thousands of inventory items, it is unrealistic to provide equal consideration to each item. Managers are required to classify these items in order to appropriately control each inventory class according to its importance rating".
There are various types of inventory control analysis techniques such as XYZ, ABC, HML, VED, S-OS etc. Here we shall focus on the XYZ.

II. OBJECTIVE

A. General objective
To categories the inventory items into X, Y & Z class.

B. Main objectives
The main objective of this analysis is to minimize the inventory cost such as turnover, labor cost, material cost etc.

III. METHODOLOGY

There are various types of inventory control analysis techniques such as XYZ, ABC, HML, VED and S-OS etc. Here we shall focus on the XYZ analysis techniques

A. XYZ analysis
The XYZ analysis is most commonly used technique in an organization. In XYZ analysis the items are classified into X, Y and Z classes based on demand variability. The variability is measured by the coefficient of variation (C.V.) the cut off line is depends on organization.

1) *X-Class:* X class material has a fixed size of need, and it is characterized by small periodic fluctuations, which provides high accuracy of forecasting, and their daily demand variability is about low ($CV \leq 0.3$).
2) *Y-Class:* Y class material has moderate fluctuations in need, which allows for an Average (D) accuracy of forecasting, and daily demand variability is generally intermediate ($0.3< CV \leq 0.56$).
3) *Z-Class:* Z class material has irregular demand need, which allows for low accuracy of fore-casting and daily demand

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variability is about high (CV > 0.56).

TABLE 1
Shows particulars of XYZ analysis

Particulars	X-class item	Y-class item	Z-class item
Fluctuation	low	Intermediate	High
Control	High	Intermediate	Low
Check	Tight	Intermediate	No
Safety stock	High	Low	Rare

B. Procedure of XYZ analysis

The XYZ analysis consists of fallowing basic Steps:

Prepare the list of items and calculate their annual demand (D), average demand.

Arrange the items in the decreasing order of their annual demand (from higher to lover).

Calculate the standard deviation (S.D.), variation coefficient (C.V.) of each item.

Calculate item percentage, cumulative of item percentage and then categories the inventory item according to demand variability

Plot the graph

On the basis of cumulative of item percentage, and coefficient of variation.

On the basis of cumulative of item percentage and then categories the inventory items.

IV. CASE STUDY

A. Cash study for XYZ analysis

Step1. Prepare the list of items and calculate their annual demand, average demand (D).

Mean (Average (D)) demand is calculated by

Mean (average) demand $$D = \frac{D_1 + D_2 + \ldots\ldots\ldots + D_n}{n}$$

Step2. Arrange the items in the decreasing order of their annual demand (from higher to lover).

TABLE 2
Shows name of item, demand of three months, annual demand and average demand

Item no.	Item	8/2015	9/2015	10/2015	Annual demand	Average demand
1	Full nitrogen cylinder	205	180	250	635	211.67
2	Dummy bar bolt	205	180	225	610	203.33
3	Tundish nozzle 13mm	200	120	145	465	155
4	Coupling pin bush BC-3	200	120	100	420	140
5	Oxygen cylinder fitted	150	60	140	350	116.67
6	Slide gate plate 25mm	60	150	100	310	103.33
7	Collector nozzle 25mm	50	135	100	285	95
8	Ladle nozzle 25mm	50	120	50	220	73.33
9	A.C. sheet 3MTR	110	40	50	200	66.67
10	Full argon gas cylinder	10	12	31	53	17.67
11	MPCB 4-6 AMP	6	22	28	36	12
12	Coupling type F-80	6	16	4	26	8.67
13	Cabin fan	5	14	4	23	7.67
14	LPG regulator	11	4	2	17	5.67
15	Oxygen regulator	11	4	2	17	5.67
16	Seating well block	2	3	10	15	5

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Step3. Calculate the standard deviation (S.D.), variation coefficient (C.V.) of each item.

Standard deviation is calculated by

Standard deviation

$$\sigma_D = \sqrt{\frac{(D-D_1)^2 + (D-D_2)^2 + \ldots\ldots + (D-D_n)^2}{n-1}}$$

Coefficient of variation is calculated by

Coefficient of variation $\quad \nu_D = \frac{\sigma_D}{D}$

TABLE 3

Shows name of item, annual demand, average demand, standard deviation (S.D.), coefficient of variation (C.V.) and XYZ classification

Item no.	Item	Annual demand	Average demand	S.D.	C.V.	Category
1	Full nitrogen cylinder	635	211.67	35.47	0.1676	X
2	Dummy bar bolt	610	203.33	22.54	0.1108	X
3	Tundish nozzle 13mm	465	155	40.9268	0.2640	X
4	Coupling pin bush BC-3	420	140	52.915	0.378	Y
5	Oxygen cylinder fitted	350	116.67	49.329	0.4228	Y
6	Slide gate plate 25mm	310	103.33	45.0924	0.4364	Y
7	Collector nozzle 25mm	285	95	42.7200	0.4497	Y
8	Ladle nozzle 25mm	220	73.33	40.4145	0.5511	Y
9	A.C. sheet 3MTR	200	66.67	37.86	0.57	Z
10	Full argon gas cylinder	53	17.67	11.59	0.65	Z
11	MPCB 4-6 AMP	36	12	8.72	0.73	Z
12	Coupling type F-80	26	8.67	6.43	0.7415	Z
13	Cabin fan	23	7.67	5.508	0.72	Z
14	LPG regulator	17	5.67	4.726	0.8334	Z
15	Oxygen regulator	17	5.67	4.726	0.8334	Z
16	Seating well block	15	5	4.36	0.87	Z

Step4. Calculate item percentage, cumulative of item percentage and then categories the inventory item according to demand variability (variation coefficient).

TABLE 4

Shows name of item, annual demand, average demand, standard deviation (S.D.), coefficient of variation (C.V.) and XYZ classification

Item no.	Item	Annual demand	% items	Cumulative % of item	C.V.	Category
1	Full nitrogen cylinder	635	17.25	17.25	0.1676	X
2	Dummy bar bolt	610	16.56	33.81	0.1108	X
3	Tundish nozzle 13mm	465	12.63	46.44	0.2640	X
4	Coupling pin bush BC-3	420	11.41	57.85	0.378	Y
5	Oxygen cylinder fitted	350	9.51	67.36	0.4228	Y
6	Slide gate plate 25mm	310	8.42	75.78	0.4364	Y
7	Collector nozzle 25mm	285	7.74	83.52	0.4497	Y
8	Ladle nozzle 25mm	220	5.98	89.5	0.5511	Y

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9	A.C. sheet 3MTR	200	5.4194	94.9194	0.57	Z
10	Full argon gas cylinder	53	1.439	96.3584	0.65	Z
11	MPCB 4-6 AMP	36	0.98	97.3384	0.73	Z
12	Coupling type F-80	26	0.7061	98.0445	0.7415	Z
13	Cabin fan	23	0.6247	98.6692	0.72	Z
14	LPG regulator	17	0.4617	99.1309	0.8334	Z
15	Oxygen regulator	17	0.4617	99.5926	0.8334	Z
16	Seating well block	15	0.4074	100	0.87	Z

Step5. Plot the graph

On the basis of cumulative percentage of item, and coefficient of variation.

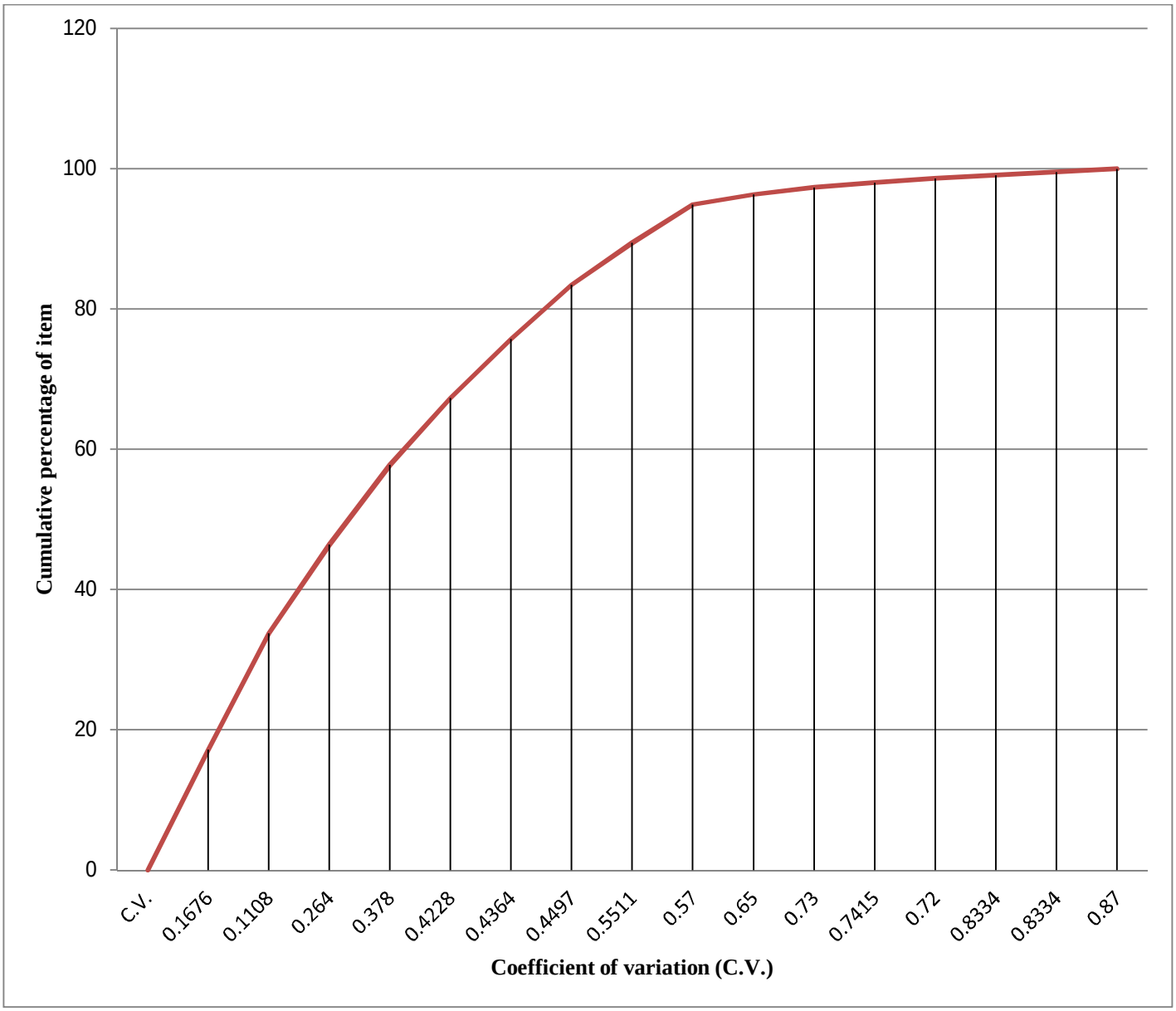

Figure1. Shows graph between coefficient of variation (C.V.) and cumulative of item percentage

On the basis of cumulative of item percentage and then categories the inventory items.

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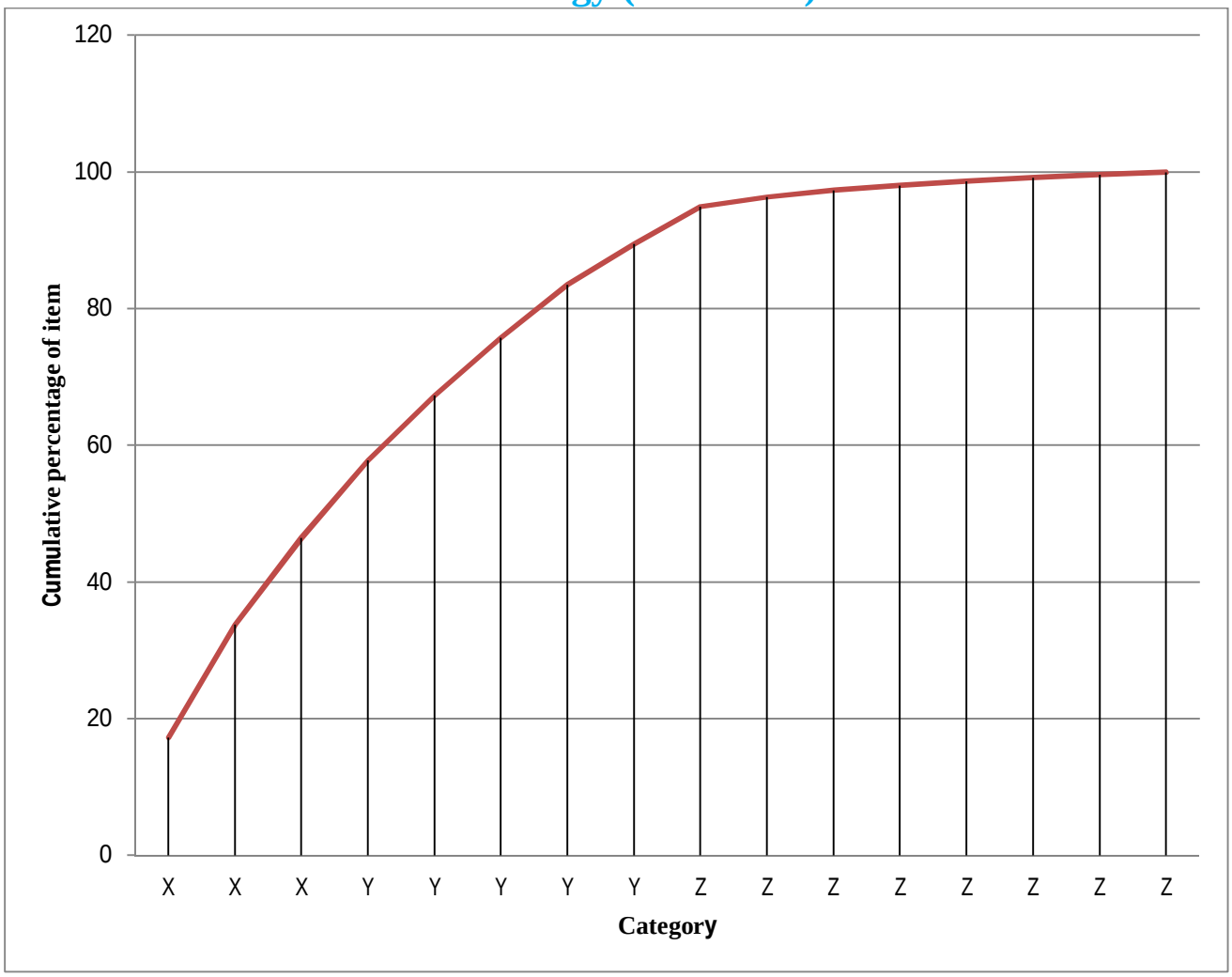

Figure2. Shows graph between cumulative percentage of item and classification of inventory item

V. RESULTS

A. Result of xyz analysis

In this analysis only generally used sixteen items is used. So their result is shown below

TABLE 5
Shows the result of HML analysis

Category	Annual demand	%Annual demand	Item used	% item used
X	1710	46.44	3	30
Y	1585	43.047	5	50
Z	387	10.513	7	70
Total	3682	100	10	100

XYZ analysis on the basis of percent Annual demand is shows in figure3.

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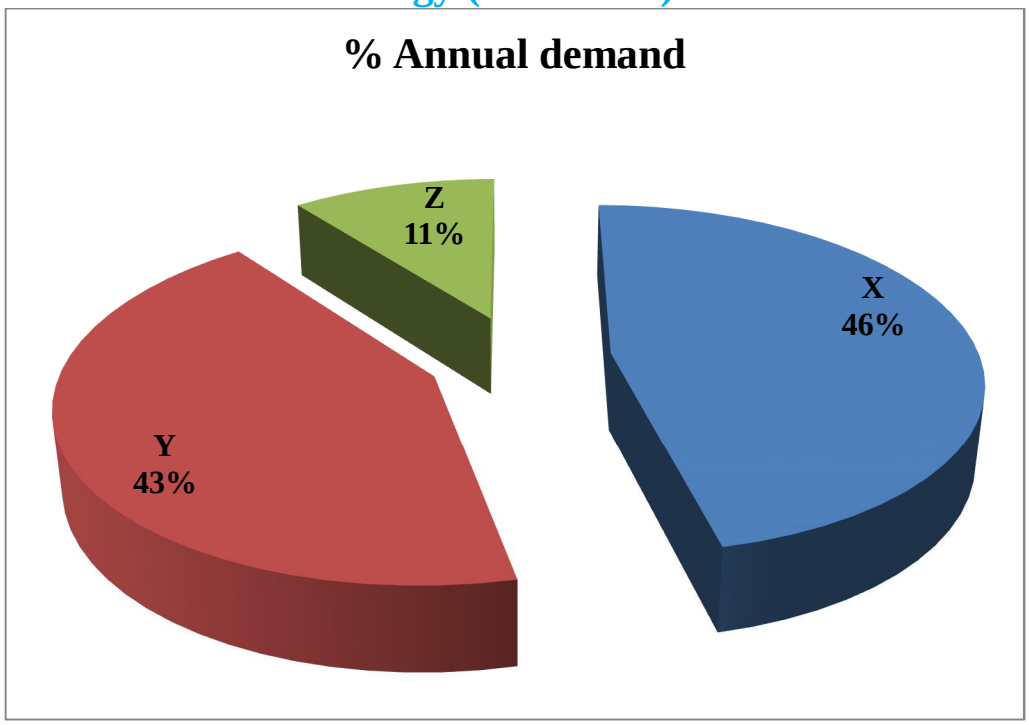

Figure3. Shows XYZ analysis on the basis of percent Annual demand

XYZ analysis on the basis of %item used is shows in figure 4.

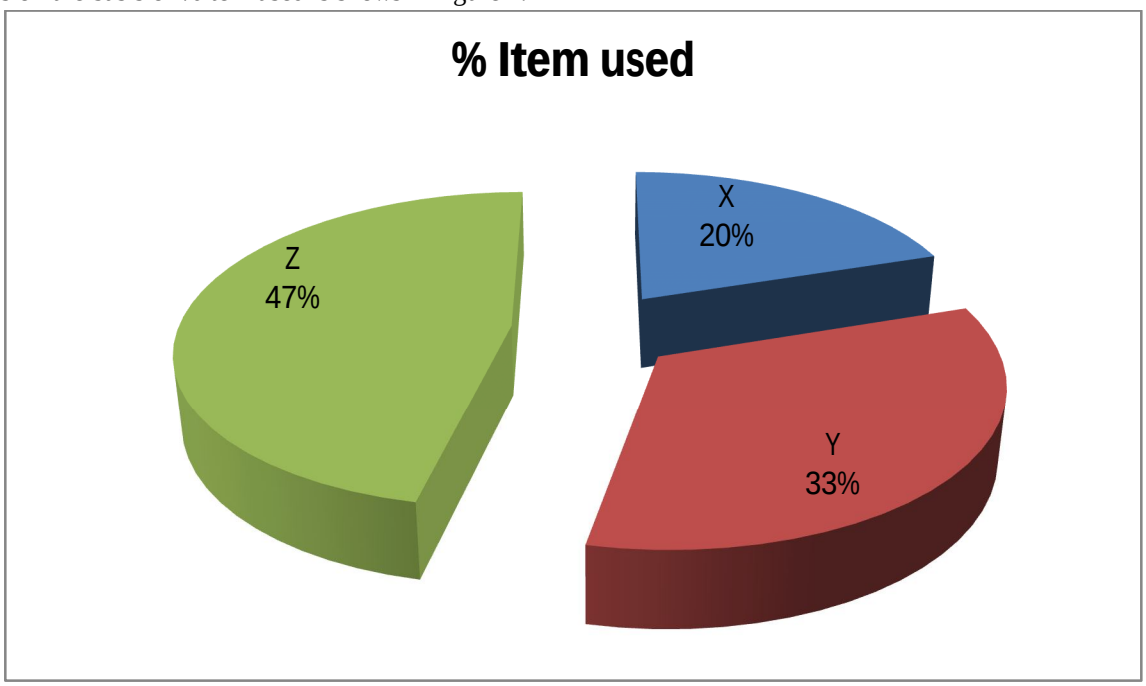

Figure4. Shows XYZ analysis on the basis of %item used

VI. CONCLUSION

In manufacturing atmosphere, company wants to balance between critical stock- outs and minimizing inventory costs material cost. From the above study we have found that this analysis help to managing inventory item effectively not only for raw material but also for finished goods. It will help to understanding of problems occurs due to buying the inventory material cost and safety stock.

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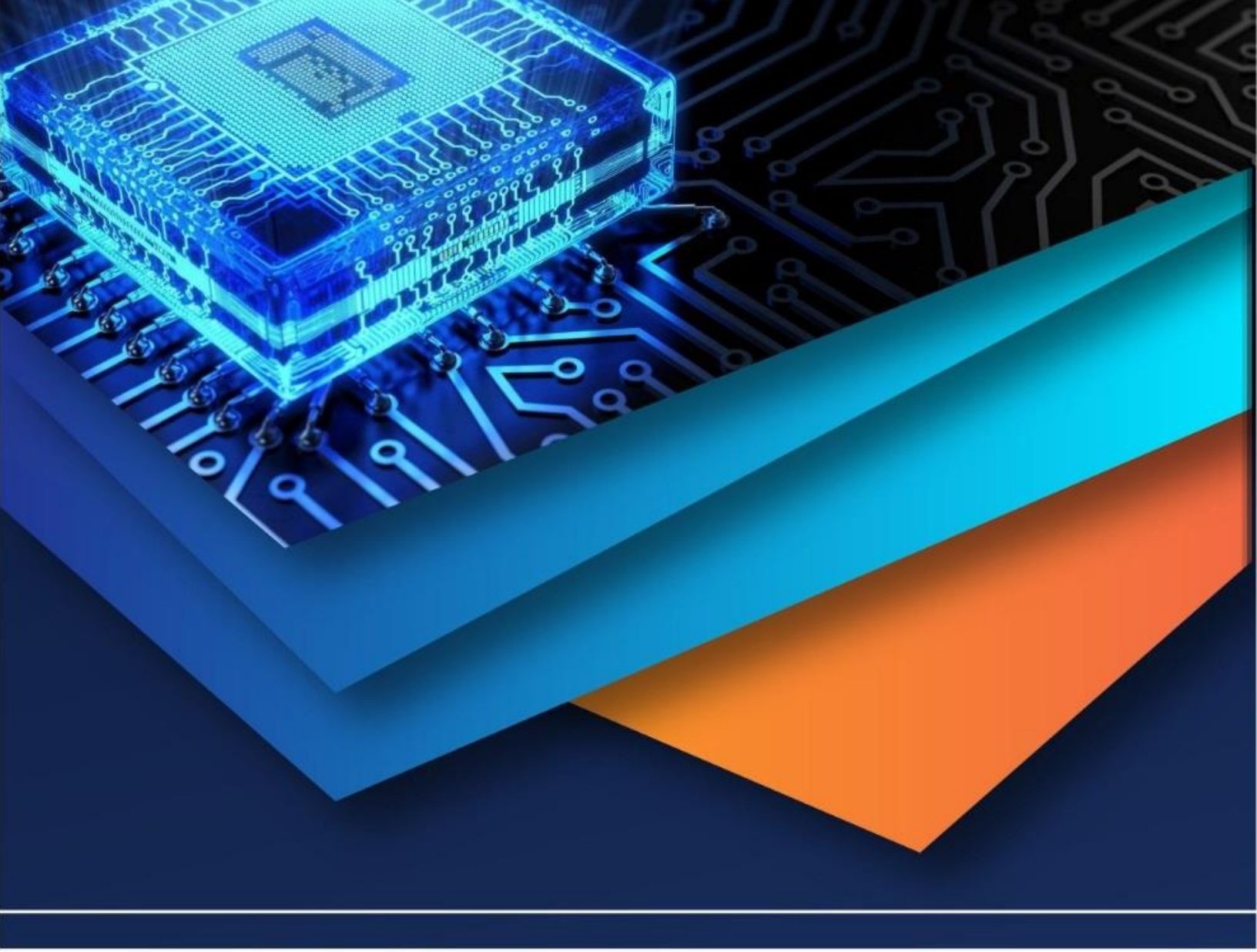

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