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Assessment of Water Quality Parameters of Gomti River

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Abstract: ***The Gomti originates from Gomat Taal (Fulhaar jheel) near Madho Tanda, Pilibhit, India. It extends 960 km through Uttar Pradesh and meets the Ganges near Saidpur, Kaithi, 27 km from Varanasi district. The Earth is facing issues with a large kind of pollutants. Healthy soil, clean water, and air are very much necessary to live properly. In today's world, Soil, water, and air are not any longer clean and pure however create human health risks. Gomti receives immense quantities of untreated waste, agricultural runoff, brings heaps of pesticides, fertilizer, street washout's transportation oil, asphalt, sediment, and lots of sorts of serious metals from different sources. The study area covers the Gomti River in part of Lucknow city of Uttar Pradesh lies between 80.899893 to 80.968180 N latitude 26.886799 to 26.833321 E longitude. To thoroughly investigate the Physico-Chemical Parameters in the Gomti River of Lucknow city, a total of eight sampling sites were selected between Guaghat upstream and Piparaghat. Samples are collected and analyzed from the proposed locations. The Physico-chemical parameters in the water of river Gomti were assessed to know about the water quality of the river. Parameters like temperature, TSS, TDS, pH, Hardness, Turbidity, Dissolved Oxygen (DO), Nitrate, Chlorine, Alkalinity, Calcium, Magnesium, BOD, COD were determined. After analysis of the parameters in the laboratory, variation of the parameters at a different location is analyzed. We present this variation through the graphs. Variation of many of the parameters is within limit according to the standards limit but some parameters show the excess pollution in the river. Dissolved Oxygen is zero at three sites and other three sites it is below 3 PPM which shows the pollution in water. It could be due to the high discharge of water from the catchment area, industries, and various drains. We also analyzed the correlation between the parameters. It will help to know the variation in any parameters by changing the value of other parameters.***

Keywords: Gomti River, Water quality parameters, Water quality management, Surface water Quality, GPS.

I. INTRODUCTION

The surface water quality is a matter of serious concern today. Rivers due to their role in carrying off the municipal and industrial wastewater and run-off from agricultural land in their vast drainage basins are among the most vulnerable water bodies to pollution. The surface water quality in a region is largely determined both by the natural processes (precipitation rate, weathering processes, and soil erosion) and the anthropogenic influences viz. urban, industrial and agricultural activities and increasing exploitation of water resources. The municipal and industrial wastewater discharge constitutes the constant polluting source, whereas, the surface run-off is a seasonal phenomenon, largely affected by climate in the basin. Seasonal variations in precipitation, surface run-off, groundwater flow, and water interception and abstraction have a strong effect on river discharge and subsequently, on the concentration of pollutants in river water Since, rivers constitute the main inland water resources for domestic, industrial, and irrigation purposes, it is imperative to prevent and control the rivers pollution and to have reliable information on the quality of water for effective management. In view of the spatial and temporal variations in the hydrochemistry of rivers, regular monitoring programs are required for reliable estimates of the water quality. This results in a huge and complex data matrix comprised of a large number of Physico-chemical parameters, which are often difficult to interpret and draw meaningful conclusions. Further, for effective pollution control and water resource management, it is required to identify the pollution sources and their quantitative contributions.



Fig. 1



Fig. 2

Water pollution in Gomti River

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II. METHODOLOGY

A. Site Description

The study area covers the Gomti River in part of Lucknow city of Uttar Pradesh lies between 80.899893 to 80.968180 N latitude 26.886799 to 26.833321 E longitude. To thoroughly investigate the Physico- Chemical Parameters in the Gomti River of Lucknow city, 8 different sites are further selected for sampling purposes and analysis. Samples are collected and analyzed from the proposed locations once a month for 2 months (January-February). Samples are analyzed for physicochemical characteristics that are pH, Turbidity, Electrical Conductivity, Total dissolved Solids, Total Suspended Solids, Total Hardness, Calcium Hardness, Alkalinity, Chloride, Sulphate, Nitrate, Fluoride, etc.

The Eight sites were selected for the water quality parameters in the Gomti River. Samples from 8 points were collected in the middle of the Gomti River, Coordinates of each sample point location were recorded in the field through handset GPS. These sample point locations have been shown in Table.

Table 1: Location of Sampling Points

S.No.	Locations	Latitude	Longitude
I.	Gaughat	X:80.899893	Y:26.886799
II.	Kudia Ghat	X:80.911987	Y:26.874454
III.	Mohan Maikain	X:80.920119	Y:26.871519
IV.	Hanuman Setu	X:80.935602	Y:26.858943
V.	Hyderabad colony	X:80.948044	Y:26.862579
VI.	Bairrage	X:80.962147	Y:26.861414
VII.	River front	X:80.970994	Y:26.852400
VIII.	Piparaghat	X:80.968180	Y:26.833321



Fig. 3 Location of sites

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B. Sampling Procedure

The groundwater samples were collected in a pre-cleaned tarson of 1000mL capacity. Proper procedure was followed as described by APHA-AWWAWPFC (23rd edition) for the sampling and the analysis purpose of the selected parameters to avoid any contamination during collection, storage, and precise determination of concentrations of the groundwater samples. Each sample in the collected bottles was capped tightly to avoid leakage and contamination from any pollutants during handling and transportation. The bottles were adequately labeled by date and locations, the source of water to recognize sampling point during chemical analysis. All the collected samples were preserved in cold and transported to the laboratory where they were stored in the freezer at 4 °C until used for final chemical analysis.

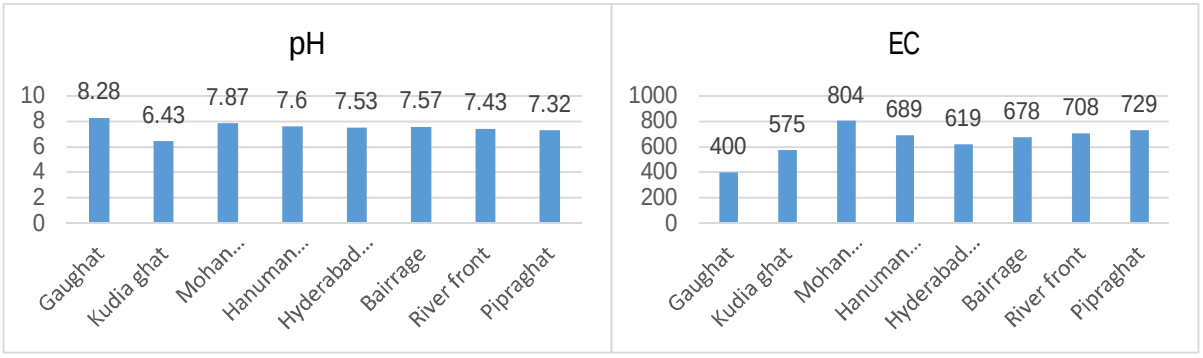


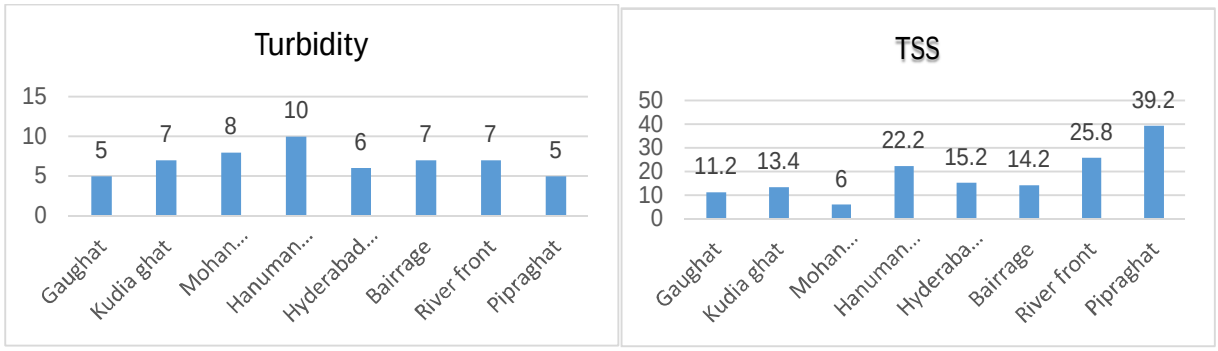
Fig. 4 Sampling

III. RESULT AND DISCUSSION

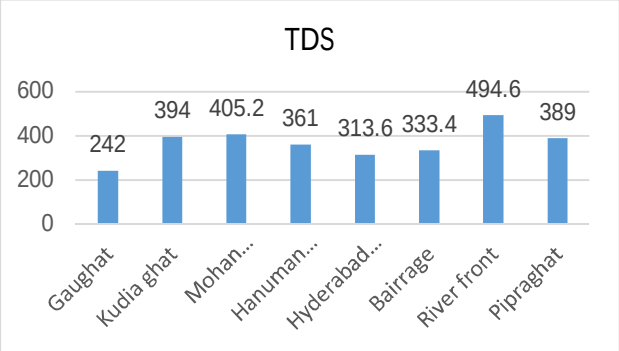
The laboratory analyses of the water quality samples of the 8 sample sites. The water samples were analyzed for physicochemical characteristics. A total of nine physicochemical parameters were analyzed namely Temperature, Electrical conductivity, Turbidity, Total suspended solids (TSS), Total dissolved solids (TDS), pH, Hardness, Dissolved oxygen (DO), Biochemical oxygen demand, chemical oxygen demand, Nitrate, Sulfate, Chlorine, Fluoride, Alkalinity, Calcium, Magnesium.

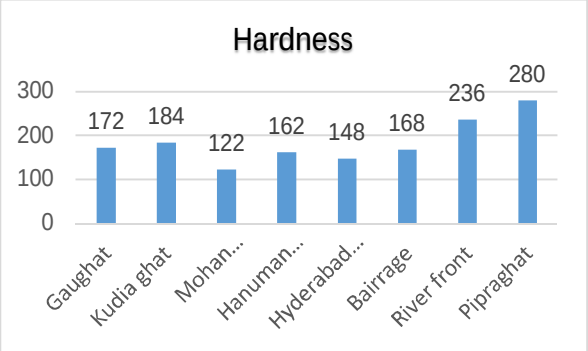
A. Comparison Of Parameters At Different Sites

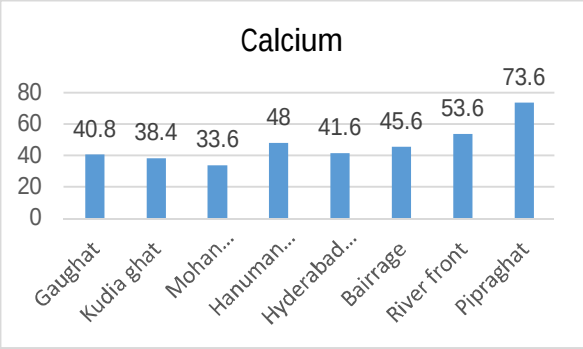


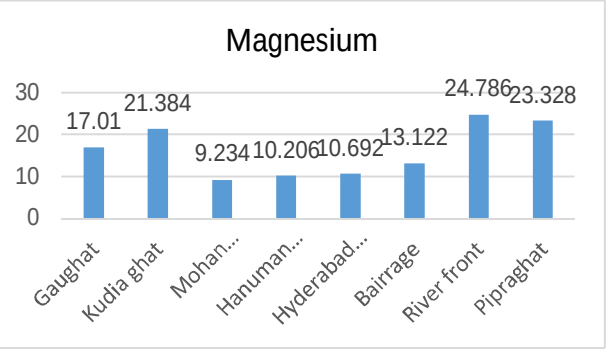


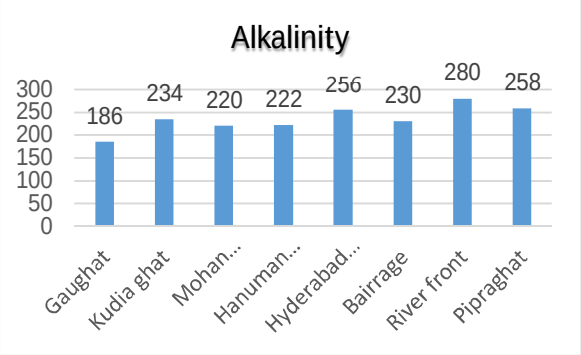
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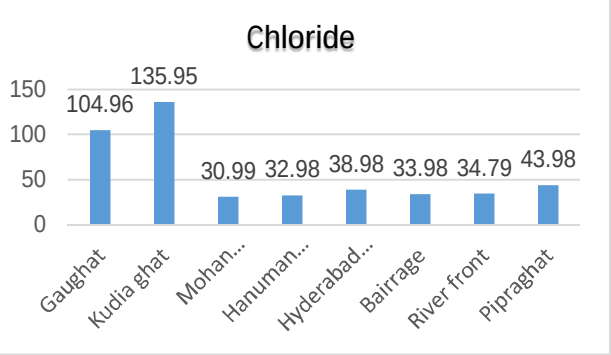


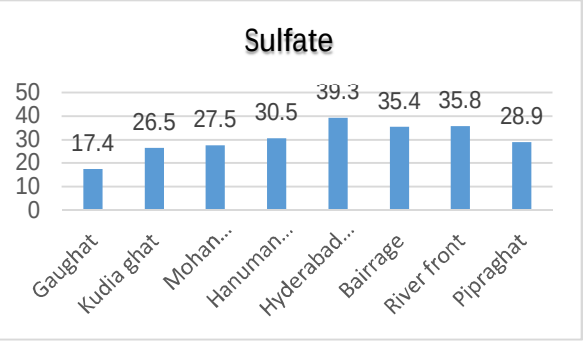


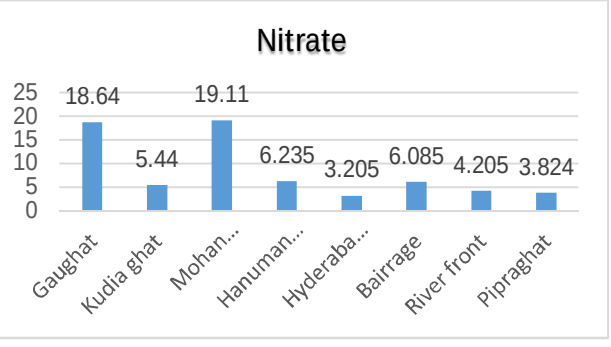




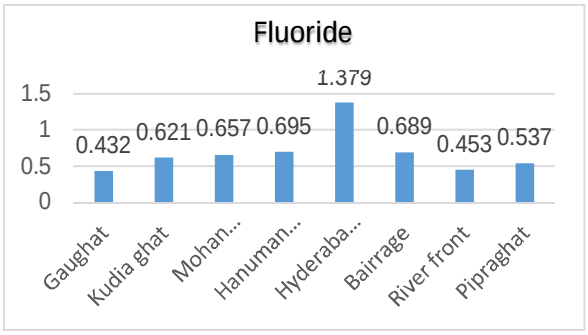


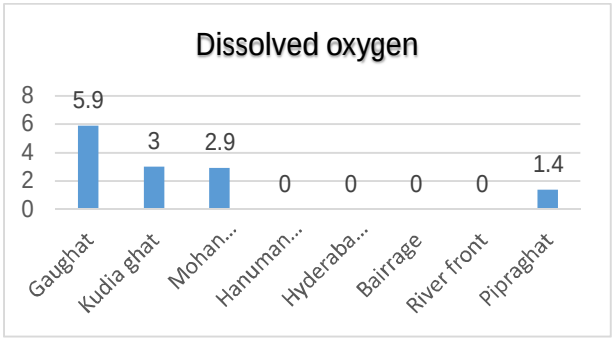


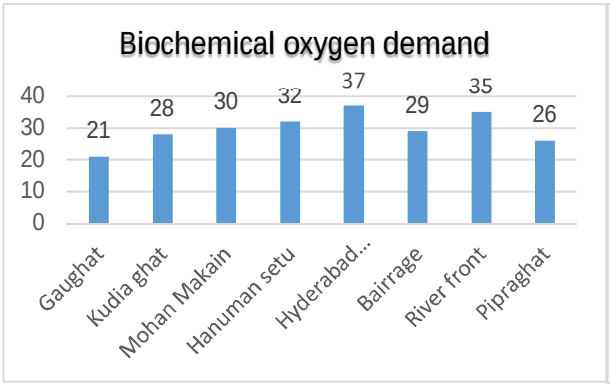


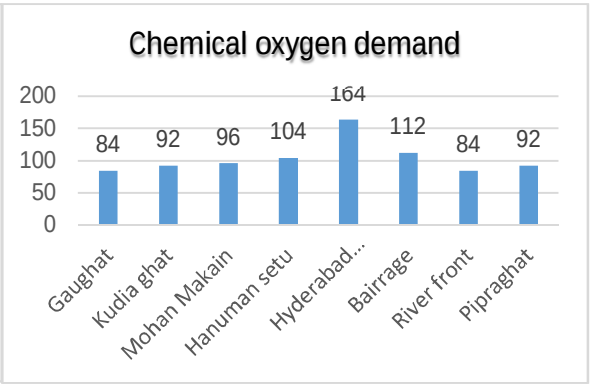


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Permissible limit of pH varies 6.5 to 8.5. From the above readings, pH value of the different sites is within the permissible limit except kudiaghat (6.43). It may be due to washing of cloths near that ghat. Turbidity at different sites are more than from the permissible limit (1 – 5 NTU). It is due to different types of pollution such as drains, waste from temple, etc. All other parameters are also within permissible limit. Dissolved Oxygen is zero at three sites and other three sites it is below 3 PPM which shows the pollution in water. It could be due to high discharge of water from the catchment area, industries, and various drains.

Table 2. Correlation among the estimated water quality parameters

	pH	Temperature	E C	Turbidity	TSS	TDS	Hardness	Calcium	Magnesium	Alkalinity	Chloride	Sulphate	Nitrate	Fluoride	DO	BOD	COD
pH	1																
Temperatu	-0.06809	1															
EC	-0.15768	0.245069	1														
Turbidity	-0.09185	-0.65778	0.458262	1													
TSS	-0.23742	0.592964	0.276554	-0.20869	1												
TDS	-0.47357	0.37977	0.703592	0.327123	0.365951	1											
Hardness	-0.30857	0.769531	0.089095	-0.44676	0.903059	0.397886	1										
Calcium	-0.13125	0.687282	0.262294	-0.32221	0.976506	0.277474	0.909964	1									
Magnesium	-0.44697	0.683329	-0.13984	-0.48873	0.598226	0.446647	0.867795	0.583595	1								
Alkalinity	-0.48023	0.583723	0.532766	-0.06718	0.599226	0.727815	0.555826	0.521441	0.463578	1							
Chloride	-0.38695	-0.19937	-0.7341	-0.32442	-0.26935	-0.29191	0.01248	-0.29119	0.373372	-0.40582	1						
Sulphate	-0.25809	0.179262	0.539211	0.219461	0.217775	0.399326	0.028863	0.157651	-0.1324	0.764318	-0.6411	1					
Nitrate	0.64617	-0.25408	-0.2272	-0.02608	-0.62379	-0.35588	-0.50218	-0.52814	-0.35051	-0.76945	0.178348	-0.71785	1				
Fluoride	-0.06724	-0.27817	0.068655	0.031374	-0.20649	-0.26559	-0.44115	-0.25891	-0.55361	0.223327	-0.26402	0.612936	-0.33981	1			
DO	0.249575	-0.10595	-0.68496	-0.44185	-0.36922	-0.48542	-0.10556	-0.29859	0.151102	-0.7134	0.742067	-0.93103	0.723678	-0.43638	1		
BOD	-0.22288	-0.0838	0.50918	0.425206	0.048724	0.481755	-0.16493	-0.07967	-0.2275	0.688791	-0.56128	0.885623	-0.54552	0.632524	-0.82227	1	
COD	0.002223	-0.22359	0.041199	-0.01493	-0.16726	-0.32427	-0.40283	-0.19886	-0.55054	0.219122	-0.32034	0.647233	-0.36925	0.985813	-0.47182	0.605652	1

Correlation between various parameters shows the variation of different parameters with the variation in other parameters. The high positive correlation was found between BOD and Fluoride (0.985813), Calcium and Total Hardness (0.909964), Hardness and TSS (0.0.903059), Calcium and TSS (0.0.976506), Magnesium and Hardness (0.867795). While the negatively correlated values were found between EC and pH (- 0.15768) and Turbidity and pH (-0.09185) DO and Hardness (-0.10556).

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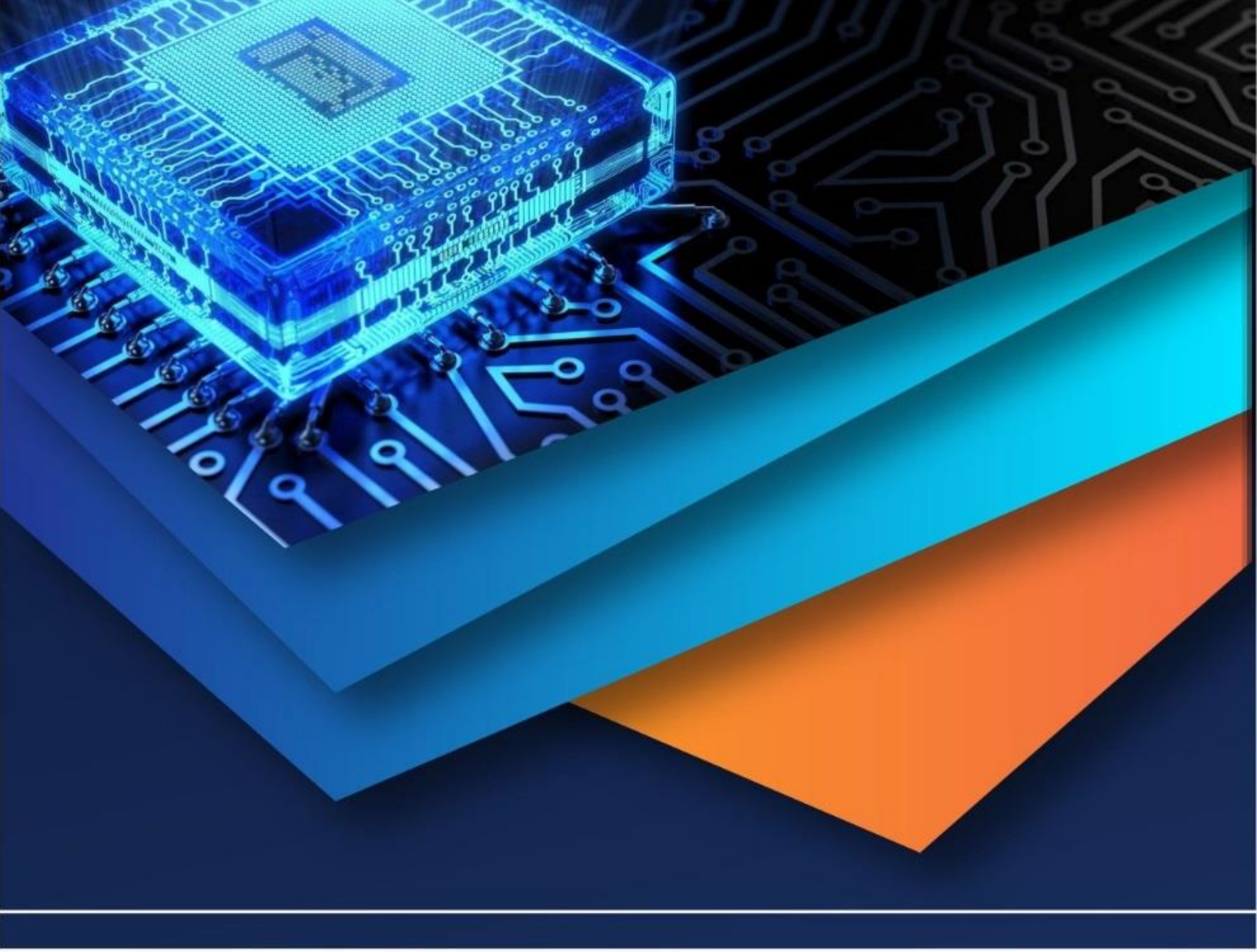
IV. CONCLUSION

In the present study, the maximum PH value was at Gaughat (8.28) which was slightly higher than the desirable limit and the minimum value was at (6.43). Dissolved oxygen concentration is a remarkable Indicator of water pollution (Basavaraddi *et al*., 2012). Fish and other aquatic animals depend upon DO, which dependent on the water temperature. The maximum DO in water was observed at Gaughat i.e. 5.9 mg/l and the minimum is zero at Hanuman Setu, Hyderabad colony, Barrage, Riverfront, Piparaghat. The maximum desirable limit for chlorides is 250mg/l with relaxation up to 1000 mg/l. Chloride content is within the permissible limit at all the sites. The PH, DO, Fluoride, and other parameters at some of the sites were beyond permissible limit, water was polluted and is not suitable for beneficial uses without conventional treatments. The river is highly polluted due to the discharge of domestic and industrial waste through several drains. The increase in value of chloride and total hardness was also due to domestic discharges. Increased concentration of Fluoride in water at Hyderabad colony area and Zero DO at Hanuman Setu, Hyderabad colony, Barrage, Riverfront and Piparaghat could be due to high discharge of water from the catchment area, industries, and various drains.

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