

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– III (New) EXAMINATION – WINTER 2019

Subject Code: 2134004

Date: 05/12/2019

Subject Name: Green Chemistry & Technology

Time: 02:30 PM TO 05:00 PM

Total Marks: 70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

		MARKS
Q.1	(a) What is the difference between Green Chemistry and Environmental Chemistry?	03
	(b) What are the main objectives of integrated waste management? Define the 4R in terms of green chemistry.	04
	(c) Are supercritical fluids green in nature? Justify your answer with the help of suitable example.	07
Q.2	(a) Write the dangerous effects of leads and arsenic poisoning on human health?	03
	(b) Comment on the challenges for sustainable development in our country and suggest a way to overcome the same.	04
	(c) Describe with neat sketch cyclone, venturiscrubber for the air purification.	07
	OR	
	(c) Explain the construction of solar panel with the utilization of solar energy for various purposes.	07
Q.3	(a) Enlist the national ambient air quality standards?	03
	(b) Find the diameter of a particle with specific gravity of 2.65 removed in a tank having surface area of 250 m ² and treating 12 MLD of water per day. Assume temperature = 26°C.	04
	(c) Design a sedimentation tank for the city of Stillwater treatment plant expansion using high-rate settlers. The maximum day design flow is 0.5 m ³ /s. Assume a well settling alum floc, a water temperature of 10°C, that the angle of settler tube is 60°, and that the tubes have a hydraulic diameter of 50 mm and surface overflow rate is 150 m ³ /m ² /day. Assume suitable necessary data.	07
	OR	
Q.3	(a) Why does industry need Green Chemistry?	03
	(b) Calculate the emission of NO _x from all the vehicles in India, in 2018. The fleet average NO _x emission factor for 2018 was 1.645 g/miles and the total vehicles miles travelled (VMT) in that year were 13.53 billion miles.	04
	(c) A plane sedimentation tank with a length of 20 m, width of 10 m and a depth of 3 m is used in a water treatment plant to treat 4 MLD. The average temperature of water is 20°C. Density of water is 998.2 kg/m ³ , Take specific gravity = 2.65. Find (a) SOR (b) Did the particle which can be removed with 100% efficiency.	07
Q.4	(a) What is zero waste technology?	03
	(b) Discuss supercritical carbon dioxide as a safer solvent in Green Chemistry with two examples?	04
	(c) An activated sludge system is operating at equilibrium with the following information:	07

Waste water flow rate = $500 \text{ m}^3/\text{liter}$, Influent BOD = 150 mg/liter ,
 Effluent BOD = 10 mg/liter , HRT = 8 hours, Mean cell residence time =
 240 hours, Volume of tank = 4000 m^3 , MLSS = 2000 mg/liter .
 Find (a) F/M ratio (b) The mass of solid waste from the system in kg/day.

OR

- Q.4** (a) What are green fuels? Why these are considered as non-polluting and clean fuels? **03**
- (b) What do you mean by wind energy? Write the advantage and disadvantage of nuclear power plant. **04**
- (c) Assume the annual energy requirement of an industry is 5000 kWh. Calculate what will be the size of wind turbine that is required to be installed to meet the energy requirement. Assume the following data: Annual energy requirement is = 6000 kWh. Propeller type wind machine is used, Coefficient of performance = 0.50, wind speed at 13 m height is 4 m/s, density of air is 1 kg/m^3 , capacity factor = 0.30 (i.e., 30% of the time, wind machine is producing energy at rated power. Number of hour in year = 8670 hour. **07**
- Q.5** (a) Briefly discuss the energy flow in the ecosystem. **03**
- (b) Explain twelve principles of Green Chemistry, with suitable examples. **04**
- (c) Enlist the various types of water treatment process for maintaining the quality of water. Describe the various types of aerator used for the water treatment. **07**

OR

- Q.5** (a) Bring out the important aspects of renewable sources. **03**
- (b) Explain benefits of 'Green Chemistry' to human health, environment and economy & business. **04**
- (c) Write short notes on the following: **07**
- (a) Ozone depletion
 - (b) Global climate change
 - (c) Carbon footprint
