Exam: I B Tech (E, F G, H) **End-Semester** **Session: 2022-23**
Subject: Environmental Science, Modular (ESI 101) **(Monsoon)** **Max. Mark: 100**

There are 4 Parts in this question paper. Start each Part from a New Page. Answer all parts of each question at one place only. Name the Section and their Answer numbers properly. Assume data suitably if required.

(Answer All Questions)

Question No			Marks
		Part-1 (25 Marks)	
1.	a	The BOD_3 of a wastewater sample is determined to be 173 mg/L at 20 °C. The k value is known to be 0.27 per day at 20 °C. What would the BOD_5 be if the test was run at 18 °C? Assume that the value of temperature coefficient is 1.047. Assume all other data suitable if necessary.	6
	b	A wastewater treatment plant of city discharges 126000 litre/minute of treated effluent having an ultimate BOD of 77 mg/L into a stream with a flow of 8.70 m^3/s and a BOD of its own equals to 7.5 mg/L. Assuming complete and instantaneous mixing, estimate the ultimate BOD of the river just downstream from the outfall. If the permissible limit of the BOD after mixing is 15 mg/L, then what should be the BOD value of the treated effluent?	3+3
	c	Name any two treatment processes that are required to treat turbid surface water but they are not required for treating hard groundwater. Also, name any two treatment processes that are required to treat hard groundwater but they are not required for treating turbid surface water.	2+2
	d	(i) Suppose, 2.5 lakh Joules of energy is supplied by Sun to the first trophic level in a food chain and if the highest trophic level of the same food chain requires at least 25 Joules of energy for survival, then how many trophic levels are possible according to the Lindemann;s Law? (ii) Suppose a population of butterflies is growing according to the logistic equation. If the carrying capacity is 1000 butterflies, r = 0.2 individuals/(individual*month), 10 % butterflies immigrated, and 5% butterflies emigrated, then what is the maximum possible growth rate for the population?	3+3
	e	What is the difference between the Master Horizons of forest soil profile and grassland soil profile? Explain why clay has more moisture holding capacity than silt and sand.	1+2
		Part-2 (25 Marks)	
2.	a	Discuss the health effects on human health of oxides of sulfur and CO in ambient air.	5
	b	Write the condition of atmospheric stability for changes in lapse rate.	5
	c	During ambient air monitoring following observations were recorded at one location. Classify the quality of air of this station as per CPCB 2014-15.	5

	24 hourly average (µg/m³)			
Locations	PM_{10}	$PM_{2.5}$	NO_2	SO_2
One Location	250	105	135	80

Use breakpoint concentration from the following table.

AQI Category (Range)	PM_{10} 24-hr	$PM_{2.5}$ 24-hr	NO_2 24-hr	SO_2 24-hr
Good (0-50)	0-50	0-30	0-40	0-40
Satisfactory (51-100)	51-100	31-60	41-80	41-80
Moderately polluted (101-200)	101-250	61-90	81-180	81-380
Poor (201-300)	251-350	91-120	181-280	381-800
Very poor (301-400)	351-430	121-250	281-400	801-1600
Severe (401-500)	430 +	250+	400+	1600+

$I_p = [\{(I_{HI} - I_{LO})/ (B_{HI}-B_{LO})\} * (C_p-B_{LO})] + I_{LO}$

Part-2 Continued

			Marks
	d	Show the Global circulation of air with a neat sketch by highlighting various cells and the direction of the wind in each layer	5
	c	Write the year of the following events regarding ozone depletion: ▶ The **Vienna convention** ▶ The **Montreal Protocol** on ODS ▶ The **London Amendment** ▶ The **Beijing Amendment** ▶ The **Kigali Amendment**	5

Part-3 (25 Marks)

3.	a	State the five different stratifications of the atmosphere. Write the significance of stratosphere.	5
	b	Explain greenhouse effect with the help of a suitable example which we face daily in our real life.	5
	c	Define the term global warming potential (GWP). List down the major greenhouse gases along with their primary sources.	5
	d	Using planetary energy balance calculate the temperature (in K) of the Earth. Assuming the value of solar constant = 1,361 W/m^2, Stefan-Boltzmann constant = 5.67 x 10^{-8} W/m^{2}K^4, average value of Earth's albedo = 0.31.	5
	e	List down five differences between Kyoto protocol and Paris agreement.	5

Part-4 (25 Marks)

4.	a)	Name the exact "Sustainable Development Goals" for the following descriptions (Fill in the blanks):-	1×5
	i)	Reducing number of Poor People : No Poverty	
	ii)	Promote pure water and cleanliness : clean water	
	iii)	Protecting fishes and other living organism in water : Protect Aquatic life	
	iv)	Related to cheap Green Energy: clean Energy	
	v)	Protecting land environment :	
	b) i)	Write down any five agendas of G20 Summit.	5
	b) ii)	Name the country that will take over the Presidency of 19th G20 summit in 2024.	2
	b)(iii)	Write down any six factors affecting vehicle pollution.	3
	c)	Name four 'pollutants' to be controlled as per stack emission standards, provided by Central Pollution Control Board (CPCB), for Thermal Power Plants to be installed from 2017 onwards.	4
	d)	Name any three harmful metals / chemicals present in fire crackers, mentioning their harmful impacts on human health (Answer in Tabular form).	6

Sl	*Name of Metals/Chemicals*	*Health Hazards/Impacts*
i)	Ni	
ii)	Cd	
iii)	Pb	