Total No. of Questions – [9]

Total No. of Printed Pages-[4]

G.R. No.	

Paper code - P119-122(ESE)

DECEMBER 2019 / ENDSEM

F. Y. M. TECH. (WREE) (SEMESTER - I)

COURSE NAME: Environmental Chemistry and Microbiology

COURSE CODE:CVPA11182

(PATTERN 2018:R1)

Time: [**3 Hours**]

[Max. Marks: **50**]

(*) Instructions to candidates:

1) **Answer Q.1 OR Q.2, Q.3 OR Q.4, OR Q.5 Q.6, OR Q.7 Q.8 OR Q.9**
2) **Figures to the right indicate full marks.**
3) **Use of scientific calculator is allowed**
4) **Use suitable data where ever required**

Q.1) a) 0.3 Kg of air at a pressure of 120 KN/m^2 occupies 0.15 m^3 and from this condition is compressed to 1.2 MN/m^2 according to $PV^{1.25} = C$ determine change in internal energy of the air, work done, heat transfer. [3marks]

OR

b) Determine volume required for sequential batch reactor for four operation as follows. 1. Filling, 2. Settling, 3. Aeration, 4. Decantation. The discharge is 2 m3/s and time required for filling, settling and decantation is 20 min, 40 min, and 20 min. In aeration second degree reaction is taking place having I/F and E/F BOD concentration is 400 mg/L and 10 mg/L take K=0.2 /day. [3marks]

Q2)a) Determine lapse rate when balloon is atmosphere which is reached to height of 400 m. Inside temperature of balloon is 20 ^{0}C and out side temperature is 10 ^{0}C . State weather atmosphere is stable or not when adiabatic lapse rate is 8^{0}C/ m. [3marks]

OR

b) Explain working mechanism of fabric filter and also find the number of bags required for fabric filter treating the flow rate of 2 m3/s ,/filtering velocity is 0.2 m/s. Take diameter =0.3 m and Height of bag =5 m. [3marks]

Q3)a)) Design ion exchange process for the following data. [2marks]

Cation mg/l	Anion mg/l
Ca^{++2}= 100 mg/l	SO_4^{-2}= 10 mg/l
Mg^{++}=30 mg/L	F^-=7 mg/L
Cr^{+6}=3 mg/L	OH^- =9 mg/l
Ni^{+2}=1 mg/L	

Plot bar chart

OR

b) The dissociation constant of weak mono basic acid is 2 $x10^{-4}$. Calculate the degree of dissociation in its 0.03 M aqueous solution. Also explain buffer solution and its types. [2marks]

Q4)a) In CFSTR reactor the reaction get occurred and following data is obtained

Conc. mole/L	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
-rA (mole/L-min)	0.1	0.3	0.5	0.6	0.5	0.3	0.1	0.06	0.04	0.03

Determine time of reaction in reactor by graphically and by analytically method. Also determine volume of reactor if FoA=30 mole/min for rate of reaction 0.5 mole/L-min. [8 marks]

b) Plot adsorption curve for the following data.

Mass of GAC gm	0	0.001	0.01	0.1	0.5	1
Ce mg/L	4.3	3.0	2.7	1.7	1	0.9

Also design adsorption process for the following parameter.
Mass of GAC/L =0.03 gm of GAC/L, EBCT=20 min, Q=2000 L/min, density of GAC 450 gm/L
[6 marks]

OR

Q5)a)Determine the values of bio-kinetics constant using the data in table. No.1 from the laboratory experiments carried out on CFSTR model of an activated sludge process with recycle system.
[8 marks]

Model No.	I/F substrate concentration mg/L	Reactor substrate concentration mg/L	MCRT (days)	Reactor biomass concentration X(mg/L	Detention Time (HRT) days
1	600	10	7	5000	0.4
2	600	12	4.5	2100	0.4
3	600	18	3	3100	0.4
4	600	50	1.6	1025	0.4
5	600	100	1.2	670	0.4

b)Explain stabilization pond. And determine area required in stabilization pond for following data.
Temp. of w.w. in summer is 30 ^{0}c and in winter is 20 ^{0}c , discharge is 4000m^3/d and take Kxt= 5
[6 marks]

Q6)a) Design an ASP process for the following parameter. [8 marks]
I/F BOD5= 300 mg/L, E/F BOD5=20 mg/L, Q= 20 MLD, Y=0.5, X=4000 mg/L, Kd=0.05/day, SRT = 10 days, Xr= 8000 mg/L .
Determine BOD removal efficiency, volume of reactor, HRT, sludge production rate, Qty. of oxygen required and F/M ratio.

b) Design UASB for the following parameter. [6 marks]
Q= 1MLD, I/F COD =200 mg/L, E/F COD = 10 mg/L , Velocity of upflow = 1.5 m/s, OLR= 15 Kg of COD/m3/d, Y=0.5, SRT= 40 days, Kd=0.03/day Determine sludge production rate, Diameter of UASB tank and biogas produced

OR

Q7)a) Compare prokaryote and eukaryote cells. [8marks]

b) Explain multiple tube fermentation. [6marks]

Q8)a)What are different types of organism that have been used as indicator of fecal contamination. [8marks]

b) What are different types of microorganisms found in natural water and waste water. [6marks]

OR

Q9)a) Explain in detailed microscopic method in microbiology. [8marks]
b)Explain in detailed application of microbiology in waste water treatment in detailed with example. [6marks]