



Note : Answer All Question

Q1: Answer Six (6) Only:

1. List with explain important factors that must be consideration in desgin of anaerobic treatment of WW.
2. List the major design consideration is on the supply /production of oxygen be the algae present in W.S.P.
3. List with draw steps for stabilazation of organic matter.
4. What is the main advantages and disadvantages of the UASB.
5. Draw typical layout for W.S.P.
6. Define : PBR ; EBR; FBR.
7. Classify oxidation ditches based on operational methods.
8. Classify triklng filters according to organic and hydraulic loading. (36 mark)

Q2: Desgin an Oxidation Ditch to treat daily average WW flow of 2000 m³/day having BOD₅ of 300 mg/L and compute concentration of return sludge and , SRT, size of settling tank.

= BOD₅ removal efficiency = 93%.

= F/M = 0.3 (based on MLVSS).

= Y_{obs} = 0.27, SLR = 25 m³/m².day.

(15 mark)

Q3: Using (MNRC) equation , desgin a triklng filter to treat a domastic WW for poplution equivelent 20000 to 250 l/person. day, having influent BOD₅ is 25 mg/L . Assume R₁=2, R₂=1.

(15 mark)

Q4: Desgin anaerobic contact process to remove 90% COD from 1 MLD flow of domestic wastewater to be treated in a plant operating at 30 °C . Assume the following data and desgin criteria:

= Desgin SRT, $\theta_c = 1.5 \times \text{minimum SRT}$

= Reactor MLVSS , X = 4000 mg/L.

= Total influent COD , S_{0 (total)} = 3000 mg/L.

= Soluble influent COD , S₀ = 2100 mg/L.

= Effluent total suspended solids, TSS_(et) = 100 mg/L.

= Ratio of COD: TSS = 1.75.

= Biodegradable portion of TSS = 80%.

= Process kinetic constants (at 30 °C): Y= 0.08; K_d = 0.03/day; K= 3.125/day; K_s= 360 mg/L.

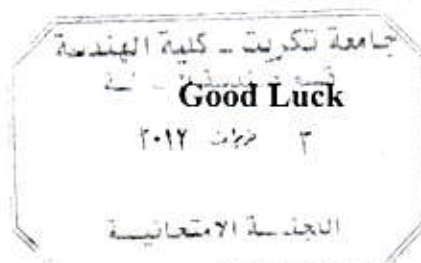
(24 mark)



Q5: Answer One Only :

1. A lagoon is 2.8 m deep and provides 8 days detention tim to an industrial WW entering at 55°C , If the mean ambient temp. in the given season is 10°C , Estimate lagoon temp. assuming compelet -mixing conditions and f= 0.5 m/day.
2. Determine the detention time for WW discharge to the faculation pond at temp. 27°C , when BOD removal 91% and K at 20°C = 0.2/ day. (10 mark)

Examiner
Dr. Salwa Hadi Ahmed



Head of Department
Dr. Tahseen Ahmad Tahseen



Note : Answer five questions only

Q1/ a-Define the following: (10m)

Basicity factor , Carbon adsorption , RBC , Flammable liquids , Solvent extraction.

Q1/ b- What is the important theories that use to minimizing the effect of industrial WW on the receiving streams. (10m)

Q2/ Give the reason of the following :- (20m)

1/ The monitoring point must have a security , 2/ Area agent effect on the dialysis process, 3/Limiting the metals which entering our system , 4/ Fixing the label bottles before taking samples, 5/ The discharge of WW shall not contains colour components.

Q3/ A conventional treatment plant use the alum and soda ash to treating a WW of plant manufacturing a soap , the WW discharge from this factory is $500 \text{ m}^3/\text{hr}$, this factory use 50 Kg/d of the soda ash , estimated the quantity of the alum that must be use to coagulant this discharge in mg/l . (20m)

Q4/a- If you use the brine in concentration of 3 mg/l to estimated the flow rate discharged to the receiving water, calculate the final total flow after injection of the brine if you know the following , salt brine flow rate $10 \text{ m}^3/\text{s}$, brine concentration in the stream 6 mg/l , final brine concentration 5 mg/l . (10m)

Q4/b- Explain the control and treatment technology of the sugar refining. (10m)

Q5/a- What is the meaning of Hydrogeation and Hydrolyzed processes in the extraction of edible oil. (10m)

Q5/b- Explain the major control parameters of the grain milling. (10m)

Q6/a- Design a flotation thicker to thicken the solids in activated sludge mixed liquor from 0.35 to 4% , assume that the following:- (10m)

$A/S = 0.008 \text{ ml/mg}$

Temperatuer = 20°C

Air solubility = 18.7 ml/L

Fraction of saturation = 0.5

Surface loading rate = $8 \text{ L/m}^2 \cdot \text{min}$

Sludge flow rate = $400 \text{ m}^3/\text{d}$

Q6/b- What is the meaning of (fouling) , types , and how it occurs. (10m)

Good Luck

Examiner

Rand R. Ahmed

Head of Department

Dr. Tahseen Ahmad Tahseen





Note Answer Four Questions Only

Q.1 Determine the order of the given differential equation, also State weather the equation is linear or nonlinear, if the equation is nonlinear, please circle the terms(s) that make it so. (25 Marks)

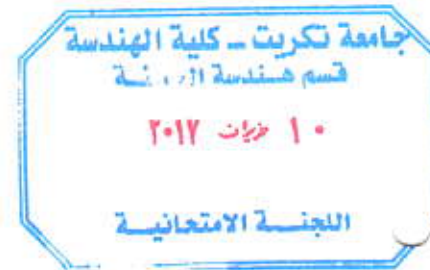
1. $y'' + yy' - 2ty = 0$

2. $y''' - e^{5t}y' + (\sin t)y = 4t^2 - 7$

3. $2t^2y^{(4)} + ty' - 6y = (12 - t - t^2)e^{\frac{1}{2}}$

4. $\frac{dy}{dt} + 3y = 6 - \tan 2t$

5. $\left(\frac{d^3y}{dt^3}\right)^2 - \left(\frac{d^2y}{dt^2}\right)^3 + \frac{dy}{dt} = 0$



Q.2 Using backward Euler method to Solve (25 Marks)

$\frac{dy}{dt} - ty - 1 = 0, y_0 = y(0) = 1, 0 \leq t \leq 1, h = 0.25$

Q.3 The open loop response, that is, the speed of the motor to a voltage input of 20V, assuming a system without damping is

$20 = (0.02)\frac{dw}{dt} + (0.06)w$ If the initial speed is zero;

use the Runge-Kutta 2nd order method and a step size of $h = 0.4s$ to find the speed at $t = 0.8s$. (25 Marks)

Q.4 Fit an exponential model to the following data set. (25 Marks)

x	0.4	0.8	1.2	1.6	2.0	2.3
y	750	1000	1400	2000	2700	3750

Q.5 Answer Only one. (25 Marks)

a. Integrate the data using Simpson's-1/3 from 1.0 to 1.4 and trapezoidal Rules for the rest.

i	0	1	2	3	4	5	6	7
Xi	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7
Fi	1.543	1.669	1.811	1.971	2.151	2.352	2.577	2.828

b. Use Trapezoidal Rule to find the integral of $w(t)$ from $t=-2$ to $t=4$. The data are shown in table below.

t	-4	-2	0	2	4
w	7	4	3	-1	2

Examiner Prof. Dr. Farhadh

Good Luck

Dr. Tahseer A. Tahseer

HEAD OF DEPT.
Dr. Tahseer A. Tahseer



ملاحظة: الاجابة على اربعة اسئلة فقط.

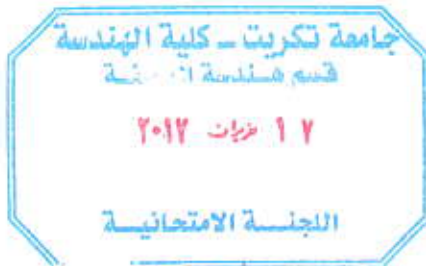
(25) درجة

س1: اجب عما يلي بما يناسبه

- 1- من محددات استخدام المادة الكيميائية.....
- 2- يعتمد الترشيح الانفراغي على
- 3- عند استخدام CaO للحماة المنشطة بنسبة.....
- 4- من مؤشرات عدم سلامة تشغيل المخمر هو
- 5- يحدث تلوث البيئة بسبب
- 6- الاس الهيدروجيني للكومه هو
- 7- يتم اضافة النتروجين بنسبة
- 8- يتم تحلل الحماة على مراحلو.....
- 9- البسترة او التعقيم الحراري يتم خلال
- 10- الوزن النوعي للمادة الطيارة.....

(25) درجة

س2: علل ماييلي



- 1- اختلاف البوليمرات العضويه
- 2- لايمكن استخدام الردم الابشروط
- 3- اختلاف المحتوى المائي للحماة
- 4- تكون نسبة الرطوبة بالكومبست 50-60%
- 5- تفضل المعالجة الحرارية على المعالجة الهوائية الرطبة
- 6- يجب ان يكون هناك توازن بين البكتريا المخمرة
- 7- استخدام الضغط في المكبس المرشح
- 8- استخدام الرمل في احواض التجفيف
- 9- استخدام المزج عند المعالجة
- 10- لا يفضل استخدام المواد الكيميائية اثناء معالجة الحماة



(25) درجة

س3: اختر الاجابة الصحيحة بوضع دائرة حولها

1- زمن دوران المكبس للحماة المنشطة

- | | |
|---------|------------|
| (أ) 3hr | (ب) 1.5 hr |
| (ت) 2hr | (ث) 2.5hr |

2- زمن بقاء الحمأة في الاحواض

- (أ) 15 يوم
(ب) 15-21 يوم
(ت) 4-7 يوم
(ث) 15-20 يوم

3- نسبة المادة الصلبة عند التكيف الكيميائي

- (أ) 20-30%
(ب) 15-30%
(ت) 15-20%
(ث) 30-40%

4- درجة حرارة الحرق هي

- (أ) 340
(ب) 330
(ت) 230
(ث) 380

5 - تتم التهوية لمدة تتراوح

- (أ) 10-22
(ب) 10-20
(ت) 12-22
(ث) 12-20

6- زمن الحجز الهيدروليكي للهضم اللاهوائي

- (أ) 40-60
(ب) 15-30
(ت) 10-40
(ث) 30-60

7- السوائل المعادة الى بداية المحطة ترفع قيمة BOD الى

- (أ) 20%
(ب) 30%
(ت) 35%
(ث) 10%

8- نسبة المواد الصلبة في السماد هي

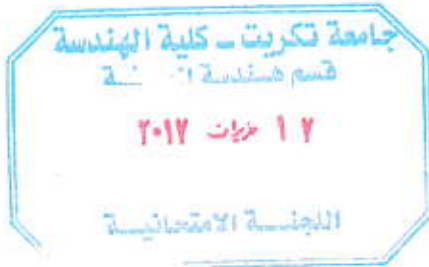
- (أ) 80%
(ب) 60%
(ت) 50%
(ث) 70%

9- نسبة الكربون الى النتروجين في الكمبوست

- (أ) 2:50
(ب) 1:50
(ت) 2:60
(ث) 1:60

10- ان نسبة الهواء الى المواد الصلبة في احواض التعويم تكون

- (أ) 4-6
(ب) 3-6
(ت) 2-4
(ث) 1-4



س4 : عرف مايلي

(1) Filter press, (2) Heat tretment, (3) Belt filtration (4) DAF, and (5) Drying beds

س5: وضح اهم الايجابيات والسلبيات والاسس التصميميه لتقنية معالجة الخبث التي تناولها تقريرك (25) درجة

رئيس القسم

أ.م.د. تحسين احمد تحسين

مع تمنياتي لكم بالنجاح

صفحة (2 من 2)

مدرس المادة

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Final Examination
Form (1)

Class : Fourth
Subject : Water reuse
Time : Three Hours
Date : 14 / 6 / 2017
Attempt : First attempt

Note :

Q1: Answer two only (10 marks for each one)

- A- List the non-conventional constituent.
- B- List the problems with open reservoirs which uses in reclaimed water storage.
- C- List the advantage & disadvantage of MF & UF.

Q2: Answer two only (10 marks for each one)

- A- Draw a diagram of extraction wells mid-way between two parallel strips of basin.
- B- Draw a diagram of advanced W.W treatment flow.
- C- Draw a diagram of the risk assessment is usually considered.

Q3: (20 marks)

Reclaimed water is being infiltrated using an apply for the recharge basin. (A) Develop a plot of the wetting front, L_f for 10 m as a function of time. (B) Develop plot of the infiltration rate, V_i , as a function of time. (C) Determine the amount of water infiltrated through a 100 m² recharge basin. ($H_w = 0.7$ m, $K = 1$ m/d, $f = 0.35$, $H_{cr} = -0.5$ m).

Q4: (20 marks)

A pretreated feedwater to a brackish water RO process contains 3000 mg/l TDS. The flow is 0.3 m³/s. the designed TDS concentration of the product water no more 600 mg/l. the net pressure is 32 atm. The membrane manufacturer provides that membrane has a water flux rate coefficient of 1.6×10^{-6} s/m and a solute mass transfer rate of 1.1×10^{-6} m/s. Determine the membrane area required.

Q5: (20 marks)

Estimate the incremental risk for 64 kg workmen exposed to carcinogen under the following circumstances. Exposure time is 6 days per week & 48 weeks per year. Over 30 yr. period the worker assumed to breath 20 m³ of air per day. The carcinogen has a potency factor (PF) of 0.02 (mg/kg.d)⁻¹ and its average concentration of 0.048 mg/l. then if a city with 1 million people use this assessment and also drink the same amount of water; how many extra cancers per year would be expected assume the standard 70 year life time.

Examiner

Asst. Lect. Mohammed.T.H

GOOD LUCK

Head of Department

Asst. Prof. Dr. Tahseen Ahmad Tahseen