Numerical Answers to Exam Question

Academic Year : 2022-2023 **Semester :** 1 **Course Code :** CV1011

Course Title : Mechanics of Materials

Tabulated By : ASK & YEH

Question No	Answer
1	(a) 70 kN, 5m right to A; (b)50 kN; (c) 20 mm; (d) 20 kN, 20x kNm, 20kN, 20x-210 kNm, -35x+315 kN, -17.5X^2+315x-1417.5 kNm
2	(a) 50kN, 10kN, 2kNm, 10kNm; (b) 0.0182 deg; (c) 1.59MPa, 0.849MPa
3	(a)(i) 12MPa, -8MPa; (a)(ii) 7MPa, 8.66MPa; (b)(i) 8.75cm; (b)(ii) 2.86MPa, 0

Numerical Answers to Exam Question

Academic Year : 2022-2023 **Semester :** 1 **Course Code :** CV1012

Course Title : Fluid Mechanics

Tabulated By : ALaw

Question No	Answer
1	(a) 0.89 m, (c) 0.966 m, 0.164 m, 0.864 m
2	(a) 0.36 m/s, 0.00284 m3/s, (b) 250 kN
3	(b) 0.064 m3/s, (c) (i) 500 rpm
4	(a) 1.69 m3/s, (b) 0.56 m3/s

Numerical Answers to Exam Question

Academic Year : 2022-2023 **Semester :** 1 **Course Code :** CV2011

Course Title : Structural Analysis I

Tabulated By : LI Bing, Liu Yu

Question No	Answer
Q1	30,-30,30 KN. BF=45 KN, BC=45 KN, FE=45 KN, ED=45 KN
Q2	15KN; 120 KNm and 15 KN.
Q3	$v_1=(w/EI)[(L-a)x^3/6+(L^2-a^2)x^2/4]$, $v_2=(w/EI)[-x^4/24+Lx^3/6-L^2x^2/4+a^3x/6-a^4/24]$, Δ_B=50.7mm ↓
Q4	Δ_{CH}=34.2mm→, Δ_{CV}=60.9mm ↓

Numerical Answers to Exam Question

Academic Year : 2022-2023 **Semester :** 1 **Course Code :** CV2013

Course Title : Engineering Geology and Soil Mechanics

Tabulated By : Wu Wei

Question No	Answer
2(b)(i)	090/20N or 270/20N
2(b)(ii)	22 m
2(c)(i)	50°
2(c)(ii)	005/50W or 185/50W
3(a)(i)	I, 40 kPa
3(a)(ii)	0.832 m
3(b)(i)	32.94 minutes
3(b)(ii)	22.56 years
3(b)(iii)	11 kPa
4(a)	8 x 10-6 m/s, 1.6 x 10^{-6} m/s
4(b)	17.93 kPa, 39.97 kPa
4(c)	8.31, 1.34

Numerical Answers to Exam Question

Academic Year : 2022-23 **Semester :** 1 **Course Code :** CV2020

Course Title : Water Resources Engineering

Tabulated By : Qin Xiaosheng

Question No	Answer
1a	Mid-channel flow contribution: 82.6%
1b(i)	flow rate left: 1.02, mid: 10.76, right: 1.02
1b(ii)	Total flow rate is 3.48% lower than that of Q1a
1c(i)(ii)	NA
2(i)(ii)(iii)	NA
3(a)	37.5 Mm3
3(b)(i)	27.47 mm/hr, 9.54 mm/hr
3(b)(ii)	143.66 mm
3(c)(i)	Q0=43.88, alpha=0.0837
3(c)(ii)	NA
4(a)	56.9 m3/s
4(b)(i)	0, 27.5, 72.5, 130, 140, 110, 62.5, 25, 10, 0
4(b)(ii)	207.9 km2
4(c)	0,1/6,1/2,5/4,25/12,23/12,5/4,2/3,1/6,0

Numerical Answers to Exam Question

Academic Year : 2022-2023 **Semester :** 1 **Course Code :** CV3011

Course Title : Reinforced Concrete Design

Tabulated By : Li Bing & Qian SZ

Question No	Answer
Q1	230.2 KNm, Z=389.5 mm As=1479 mm2; T10@250;275; 33.6
Q2	M=777 KNm; Mf=753 KNm; As=4723 mm2; 16.3
Q3	(a) Mmax=26.0 kNm/m, Max live load = 1.26 kN/m2; (b) actual L/d = 50, alloable L/d = 34
Q4	(a) 5648 or 5567 kN; (b) (678 kNm, 1813 kN); (c) (354 kNm, 4175 kN)

Numerical Answers to Exam Question

Academic Year : 2022-23 **Semester :** 1 **Course Code :** CV3013

Course Title : Foundation Engineering

Tabulated By : EC Leong

Question No	Answer
1	(c) Relative density = 47.1%; Effectve peak friction angle = 38.3^{o}
2	(b) (i) R_d = 163.2 kN, Q_d = 161 kN; (ii) Consolidation settlement = 89.5 mm
3	(b) Length of pile = 27.5 m
4	(a) (i) ODF = 1.22; (ii) ODF = 1.31

Numerical Answers to Exam Question

Academic Year : 2022-23 **Semester :** 1 **Course Code :** CV3014

Course Title : Transportation Engineering

Tabulated By : Zhu Feng

Question No	Answer
1	(a) 150+00, 61.68 (b) 40, 1931.33
2	(a) 0,0,1,1, (b) 0,1,4,5 (c) 1,2, 4.4; (D-2)/3; (2D+2)/11 (d) 3.87, 9.73,6.4,13
3	(a) 27.79, 1:2 (b) –
4	180,330
5	109.8x10^-6, 54.9x10^-6

Numerical Answers to Exam Question

Academic Year : 2022-23 **Semester :** 1 **Course Code :** CV3015

Course Title : Environmental Engineering

Tabulated By : Zhou Yan

Question No	Answer
1(a) (ii)	6.0 m/h, 3.75 m/h
1(a) (iv)	7.5 m
1(b)(i)	0.465 m
1(b)(ii)	10
2(c)(ii)	0.98
2(d)	53 mg/L, 12 mg/L, 142 mg/L
3(a)	0.1 m
4(b)	19.4 g

Numerical Answers to Exam Question

Academic Year : 2022-2023 **Semester :** 1 **Course Code :** CV4011

Course Title : Project Planning and Management

Tabulated By : TBK

Question No	Answer
1	NA
2a	245 days
2b	238 days
2c	233 days
3a	cum cost = 81100, Cum Value = 93265
3b	34591, 39010 (week 20)
4	NA

Numerical Answers to Exam Question

Academic Year : 2022-23 **Semester :** 1 **Course Code :** CV4101

Course Title : Structural Analysis III

Tabulated By : Zhao Zhiye (Q1, Q2), Yang Yaowen (Q3, Q4)

Question No	Answer
Q1(a)	2, U4' and V4'
Q1(b)	U4' = 0.000125 m, V4'=-0.000625m
Q1(c)	x = 0.0025 m
Q2 (a) (i)	2, Theta2' and V3'
Q2(a) (ii)	Theta2' = -0.0104 rad, V3' = -0.0468 m
Q3(a)	P_cr=2.198 (π^2 EI)/L^2
Q3(b)	P_cr=0.5979 (π^2 EI)/L^2
Q4(a)	alpha=10 EI/L, (π^2 EI)/L^2 < P_cr < 2.05(π^2 EI)/L^2
Q4(b)	P_cr=1.73 (π^2 EI)/L^2

Numerical Answers to Exam Question

Academic Year : 2022-23 **Semester :** 1 **Course Code :** CV4102

Course Title : Advanced Steel Design

Tabulated By : Zhao Ou

Question No	Answer
1	(a) gamma = 6.0, Beta = 0.633; (b) q = 38.640 mm, the percentage of overlapped lamda = 38.358%; (c) 884.975 kN
2	(a) 166.853 Mpa < 233.657 Mpa, OK; (b) 78.083 Mpa < 233.657 Mpa, Ok; (c) the 6 mm fillet weld will fail first
3	(a) 1968 kN; (b) 1897 kN
4	(a) 19Mp/440, Mp/30; (b) 19Mp/620, Mp/34

Numerical Answers to Exam Question

Academic Year : 2022-23 **Semester :** 1 **Course Code :** CV4107

Course Title : Engineering Economics and Finance

Tabulated By : Robert Tiong and Kim Jinwoo

Question No	Answer
2	(a) -17,274, -15,774, L; (b) -13,048, -12,290, L; (c) -14,292, -10,929, L; (d) 2, 4 (The values are all Annual Worth. Unavoidable differences due to conversion methods/factors and interpolations were marked correctly)
3	NPVs for (a) $62.9k; $-140k, -175k; (b) $171.3k; -$24.2k; 155k.
4	(a) price =$19.04

Numerical Answers to Exam Question

Academic Year : 2022-23 **Semester :** 1 **Course Code :** CV4110

Course Title : Excavation and Retaining Walls

Tabulated By : Yi Yaolin

Question No	Answer
1b(i)	1.98
1b(ii)	3.89
1b(iv)	72.65kPa
2c(i)	1.56
2c(ii)	160.92kN
2c(iii)	41.89kN/m
Q3(a)	2.12; 3.41
Q3(b)	356.8 kN; 356.8 kN; 17.8 kNm/m
Q4(a)	0.067 m

Numerical Answers to Exam Question

Academic Year : 2022-23 **Semester :** 1 **Course Code :** CV4112

Course Title : Traffic Engineering

Tabulated By : Lum Kit Meng

Question No	Answer
1	Computed Chi-Square = 52, Reject H_0
2	Capacity of Shared Lane = 235 veh/h
3(c)	Speed of forming wave = -8.15 km/h; speed of clearing wave = -24.45 km/h
4	Cycle time = 170 s; Green times are 42 s, 43 s, 40 s and 29 s
5	PTSF = 90.3%, LOS "E" and v/c = 0.886
6(a)	Queue begins at 6:40 and end at 7:30; Max queue = 80 vehicles

Numerical Answers to Exam Question

Academic Year : 2022-23 **Semester :** 1 **Course Code :** CV4116

Course Title : Coastal Engineering

Tabulated By : Prof Adrian Law and A/P Edmond Lo

Question No	Answer
Q1	(a) (ii)0.5, (iii) 1.0, 0.0, (iv) 0.73, 0.23 (b) (i) 2.2 m, 4.5 s, (ii) 3.2 m
Q2	(a) (i) 78 m, 2.5m, (ii) 1.0, 1.26, (iii) 0 m/s, 784 kPa, 1.3 m/s, 31 kPa
Q3	(a) 2.25 m, 2.56 m (b) (1.066e4, 0, 8.837e4) N/m2
Q4	(a) 017 m, (b) 0.216 m, (c) 1.63 kN

Numerical Answers to Exam Question

Academic Year : 2022-23 **Semester :** 1 **Course Code :** EM5104

Course Title : Air Quality Management

Tabulated By : A/P Edmond Lo and Dr Tuti Lim

Question No	Answer
Q1	
Q2	(a) 69.7 µg/m3; (b)33.2 ppb
Q3	
Q4	(a) (i) A: 87.5% ; B: 92.1%

Numerical Answers to Exam Question

Academic Year : 2022-23 **Semester :** 1 **Course Code :** EN1001

Course Title : Environmental Chemistry

Tabulated By : Grzegorz Lisak

<table>
<tr><th>Question No</th><th>Answer</th></tr>
<tr><td>1 (b)</td><td>
Q = 0.1kg/d = 100g/d
100g/d x 1 mole/31g = 3.23 mole/d (elemental P)
1 mole P ≡ 1 mole algae
Molecular weight of algae $C_{106}H_{263}O_{110}N_{16}P_1$
= (106 x 12) + 263 + (110 x 16) + (16 x 14) + 31
= 3550 g/mole

3.23 mole/d algae → 3.23 mole/d x 3550 g/mole
= 11,451.62 g/d = 11.45 kg/d = 4179.25kg/y

90% efficiency in nutrient utilization and wet algae
So, wet algae = 90% * 4,179.25 kg/y + 80% (90% * 4,179.25 kg/y) = 3,761.3 + 3,009.1
= 6,770.36 kg/y
</td></tr>
<tr><td>2 (a)</td><td>
<table>
<tr><th>parameter</th><th>Concentration, mg/L</th><th>Eq.wt</th><th>meq/L</th></tr>
<tr><td>CO_2</td><td>13.2</td><td>22</td><td>0.6</td></tr>
<tr><td>Ca^{2+}</td><td>79.4</td><td>20</td><td>3.97</td></tr>
<tr><td>Mg^{2+}</td><td>25.7</td><td>12.15</td><td>2.12</td></tr>
<tr><td>Na^{+}</td><td>12.0</td><td>23</td><td>0.52</td></tr>
<tr><td>K^{+}</td><td>10.1</td><td>39</td><td>0.26</td></tr>
<tr><td>Fe^{3+}</td><td>2.0</td><td>18.6</td><td>0.11</td></tr>
<tr><td colspan="3"></td><td>Sum cations =7.58</td></tr>
<tr><td>$SO_4^{=}$</td><td>81.1</td><td>48</td><td>1.69</td></tr>
<tr><td>Cl^{-}</td><td>22.1</td><td>35.3</td><td>0.62</td></tr>
<tr><td>HCO_3^{-}</td><td>263.3</td><td>50 as $CaCO_3$
61 as HCO_3^{-}</td><td>5.26
4.31</td></tr>
<tr><td colspan="3"></td><td>Sum anions = 7.57
6.33</td></tr>
</table>
So HCO_3^{-} must be quitted as mg/L as $CaCO_3$ equivalent
The calculation indicates the equivalent Cation-Anion in Jurong Lake water, a open carbonic system is balanced. Hence, the water is Jurong Lake has reached the equilibrium.
</td></tr>
<tr><td>2 (c)</td><td>
• Total Hardness = Σ $(Ca^{2+}) + (Mg^{2+}) + Fe^{3+}$
= 3.97 + 2.12 + 0.11 = 6.2 meq/L =310 mg/L as $CaCO_3$

TH > TA at pH 7.2
NCH = 310 – 215.8 = 94 mg/L as CaCO3
</td></tr>
<tr><td>2 (d)</td><td>
• Alkalinity = $[HCO_3^{-}] + 2[CO_3^{2-}] + [OH^{-}] - [H^{+}]$
At pH = 7.2 ⇒$[CO_3^{2-}] \approx 0$, $[H^{+}] \approx 0$, $[OH^{-}] \approx 0$
Alkalinity ≈$[HCO_3^{-}] + 2[CO_3^{2-}] + [OH^{-}] - [H^{+}]$ ≈ 4.31 x 50 = 215.8 mg /L as $CaCO_3$
</td></tr>
<tr><td>3 (b)</td><td>
• μ = 0.5[(0.01 × 1^2) + (0.01 × 1^2)] = 0.01 M
• μ = 0.5[(0.015 × 1^2) + (0.015 × 1^2)] = 0.015 M
• Total: 0.01+0.015= 0.025 M
The data on 4.3 mg of sand particles with the size ranging from 1 to 10 μm, 1.06 mg of microplastics of unspecified composition and 7.3 ppm of free dissolved oxygen is not relating to the calculations.
</td></tr>
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Numerical Answers to Exam Question

Academic Year : 2022-2023 **Semester :** 1 **Course Code :** EN2004

Course Title : GEO-ENVIRONMENT AND SOIL MECHANICS

Tabulated By : Xunchang Fei

Question No	Answer
1	N.A.
2	a) N.A. b) 3.08 g DO/g benzene; c) O2=317 g > 1.5 g; d) N.A.
3	a) Cr=7.4+15.4+29=51.8 g; b) t=579 d; c) N.A.; d) Fe=319.2 g precip=805.6 g; e) N.A.
4	a) sigma_p'=40 kPa OCR=1 S=0.832 m; b) t=32.94 min t= 22.56 yr Ue=11 kPa
5	a) k_sand=8x10^-6 m/s k_silty=1.6x10^-6 m/s; b) sigma_v'=39.97 kPa; c) FS_sand=8.31 FS_silty=1.34; d) N.A>

Numerical Answers to Exam Question

Academic Year : 2022-23 **Semester :** 1 **Course Code :** EN3001

Course Title : Solid and Hazardous Waste Management

Tabulated By :

Question No	Answer
Q2(b)	Total C = 1,969,950 tons
Q2(c)	NOx = 1.48 x 10^8 m3
Q2(d)	Total generation C = 1.97 x 106 tons Total recycling C = 1.18 x 10^6 tons Total incineration C = 7.29 x 10^5 tons Total emission C = 6.56 x 10^5 tons Total ash C = 7.29 x 10^4 tons Total non-incinerable C = 5.91 x 10^4 tons
Q3(a)	Excess-air volume = 2,810 m3
Q3(b)	CH4 volume = 147m3 CO2 volume = 147m3
Q4(d)	B/C = 0.702
Q5(a)	Toluene 0.36 kg/d; Benzene 0.144 kg/d; Dichloroethane 0.0048 kg/d
Q5©	Pb%: 0.02109% (wt); Cu%: 0.1075 % (wt)

Numerical Answers to Exam Question

Academic Year : 2022-23 **Semester :** 1 **Course Code :** EN3002

Course Title : Wastewater Engineering

Tabulated By : Zhou Yan

Question No	Answer
1(a)(i)	153.9 mg/L
1(a)(ii)	196.3 mg/L
1(b)(i)	600 mg/L, 326 mg/L, 274 mg/L
2(c)(i)	93%
2(c)(ii)	502 kg/d
3(c)	5376 m3/d
3(d)	0.33 gVSS/gbsCOD, 0.51 gVSS/gbsCOD
4(a)	790 m3
4(b)	189 m3, 505 m3

Numerical Answers to Exam Question

Academic Year : 2022-23 **Semester :** 1 **Course Code :** EN3004

Course Title : Air Pollution Control Engineering

Tabulated By : Wang Rong

Question No	Answer
1	(a) PM2.5 = 217 µg/m^3 ; bext = K/VR = 1,331.68 Mm^{-1} (c) i: C_i=35; I= 104 /hr ii: for 75% of the steady time, t= 0.75 (0.58) = 0.43 mins or 26 sec
2	(b) C(x,y,z) = 41.56 µg/m^3 ; PM2.5 = 33.25 µg/m^3
3	(a) Excess amount = 2.1 x 10^3 kg/hr CO2 generated (in kg) = 1.63 x 10^4 kg/hr
4	(a) Efficiency for large particles: 99% Efficiency for medium particles: 80% Efficiency for small particles: 60% (b) Cake permeability: 8.21 x 10^{-13} m^2

Numerical Answers to Exam Question

Academic Year : 2022-23 **Semester :** 1 **Course Code :** EN3006

Course Title : Energy Resources Engineering

Tabulated By : She Qianhong,

Question No	Answer
1a	0.186 kWh/km 3,260.9 kWh, $628.37, 1,086.96 L, $2,119.57
1b	8.18 years
2a	0.0077 or 0.77% 27.18 years
4b	1075 MW or 1.075 x 10^9 W 326.14 m3/s
4c	3.75x106 MWh
5a	62.8 hp

Numerical Answers to Exam Question

Academic Year : 2022-23 **Semester :** 1 **Course Code :** EN4105

Course Title : Integrated Environmental Management

Tabulated By :

Question No	Answer
Q1(iii)	pH = 3.23
Q2(a)	Ocean annual deficit = 4.7 x 10^13 m3
Q2(b)	1200 x 10^6 m3
Q5(a)	4.9x10^-4 > 1x10^-6
Q5(b)	0.143 ug/L

Numerical Answers to Exam Question

Academic Year : 2022-2023 **Semester :** 1 **Course Code :** MT1001

Course Title : Maritime Math 1

Tabulated By : ALaw

Question No	Answer
1	(a) 35, 4623, (b) 12805
2	(c) 245, (d) 1409, (e) 502
3	(b) 4; (c) 2.854
4	(b) (0,1/e) (c) 2/3

Numerical Answers to Exam Question

Academic Year : 2021-2022 **Semester :** 2 **Course Code :** MT1003

Course Title : TRADE PRACTICES AND INCOTERMS

Tabulated By : CAPT KH TAN

Question No	Answer
3B (iii)	
	Dem = 8000 USD PDPR
	DHD = means Despatch is half the rate of Dem,
	i.e Despatch = 8000/2
	= 4000 per day Pro rata PDPR
	Allowed LT = 72 Hrs
	Completed Time = 54 Hrs.
	∴ Time Saved = 72 − 54
	= 18 Hrs.
	Despatch payable = $\frac{18}{24} \times 4000$
	Ans = 3000 USD

Numerical Answers to Exam Question

Academic Year : 2022-23 **Semester :** 1 **Course Code :** MT4001

Course Title : SHIPPING LOGISTICS

Tabulated By : DR KELVIN PANG

Question No	Answer
4a	For the retailer, annual demand D = 12 x 170 = 2,040; SR = $140; hR = 0.25; CR = $14. Thus EOQ for retailer if it acts independently = √(2(2,040))(140)/(0.25(14)) = 404 units/order (after rounding to nearest integer)
4b	In jointly optimizing the order quantity: D = 2040 per year; SS = $300; SR = $140; CS = $7; CR = $14; hS = 20%; hR = 25%. Total ordering cost S = SS + SR = 600 + 150 = $750 per order. Cs (supplier) and CR (retailer) are $5 and $8 respectively. Q = √2(2,040)(300+140)/(0.20(7)+0.25(14)) = 605 (rounding off to nearest integer) Retailer's costs: Order costs = (2,040/605)(140) = $472.07 Holding costs = (605/2)(0.25)(14) = $1,058.75 Retailer's total cost = $472.07 + $1,058.75= $1,530.82 Supplier's costs: Order costs = (2,040/605)(300) = $1,011.57 Holding costs = (605/2)(0.20)(7) = $423.50 Manufacturer's total cost = $1,011.57 + $423.50 = $1,435.07 Total cost = $1,530.82 + $1,435.07 = $2,965.89 In this case, we equate the total costs associated with ordering at the EOQ and the breakpoint levels for the retailer in determining the discount level.
4c	If retailer acts independently: EOQ for Retailer = 404 units/order (from Q4(a)), Total cost = (D/EOQ)SR + (EOQ/2)hCR + CRD If order quantity is jointly optimized, EOQ for Retailer = 605 units/order (from Q4(b)), Total cost = (D/EOQ)SR + (EOQ/2)hC' + C'D, where C' is the new price to induce retailer to order at this quantity We solve for the price C' that the retailer will order the quantity 605 units/order. (2,040/404)(140) + (404/2)(0.25)(14) + 14(2,040) = (2,040/605)(140) + (605/2)(0.25)(C') + C'(2,040) Solving for C', we obtain 29,973.93 = 472.066 + C'(2,115.625) C' = $13.94475 Unit discount = $14 - $13.94475 = $0.055249

Numerical Answers to Exam Question

Academic Year : 2022-2023 **Semester :** 1 **Course Code :** MT4101

Course Title : Intermodal Transpirtation

Tabulated By : TEO CHEE CHONG

Question No	Answer
3(a)	20 knots
3(b)(i)	23.62 knots
3(b)(ii)	2,154 TEUs
3(b)(iii)	Not viable (for example by calculating to required speed, the max. throughput that can be achieved, vessel needed, ……)