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JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATION- Oct 2017

M.Tech. III Semester

COURSE CODE: 15M3WCE311 MAX. MARKS: 25

COURSE NAME: Environmental Geotechnics

COURSE CREDITS: 3 MAX. TIME: One Hour Thirty Minutes

Note: *All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means. Assume data, if necessary. Values for Error and Complimentary error function are given in Table 1.*

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[1] Derive Advection – Dispersion equation (ADE) with sorption for a 2D contaminant mass transport. **[6]**

[2] A 3 - ft – thick cut off wall is used to contain groundwater contaminated with benzene at a concentration of 1000 mg/L inside the wall. Assume that $K = 1 \times 10^{-7}$ cm/s, $D^* = 1 \times 10^{-5}$ cm^2/s, $n_e = 0.4$, $\rho_d = 1.2$ g/cm^3 and $K_d = 3.0$ cm^3/g. The groundwater source elevations inside and outside the wall are 500 ft and 501 ft, respectively. Calculate breakthrough contaminant concentration for a period of 5 years and distance 3 ft for

a) Advection – diffusion transport (exact and approximate method)

b) Diffusive transport only.

Calculate with and without sorption effects. **[5 + 3 = 8]**

[3] Consider a gasoline containing numerous compounds where the mole fractions of benzene are 0.0076 and 0.0021 for fresh and weathered gasoline, respectively. The solubility of benzene is 1780 mg/L. Calculate the effective solubility of benzene and explain its implications on the transport in the subsurface. **[4 + 2 = 6]**

[4] State giving **REASONS** weather the following statement is true or false "A soil that is found suitable as a barrier material for liners will normally be suitable for vertical cut – off walls." **[5]**

Table 1: Error and complementary error function values

u	*erf* (u)	*erfc* (u)
0.00	0.0	1.0
0.05	0.0563720	0.9436280
0.10	0.1124629	0.8875371
0.15	0.1679960	0.8320040
0.20	0.2227026	0.7772974
0.25	0.2763264	0.7236736
0.30	0.3286268	0.6713732
0.35	0.3793821	0.6206179
0.40	0.4283924	0.5716076
0.45	0.4754817	0.5245183
0.50	0.5204999	0.4795001
0.55	0.5633234	0.4366766
0.60	0.6038561	0.3961439
0.65	0.6420293	0.3579707
0.70	0.6778012	0.3221988
0.75	0.7111554	0.2888446
0.80	0.7421008	0.2578992
0.85	0.7706679	0.2293321
0.90	0.7969081	0.2030919
0.95	0.8208907	0.1791093
1.00	0.8427007	0.1572993
1.10	0.8802050	0.1197950
1.20	0.9103140	0.0896860
1.30	0.9340079	0.0659921
1.40	0.9522851	0.0477149
1.50	0.9661051	0.0338949
1.60	0.9763484	0.0236516
1.70	0.9837905	0.0162095
1.80	0.9890905	0.0109095
1.90	0.9927904	0.0072096
2.00	0.9953223	0.0046777
2.10	0.9970205	0.0029795
2.20	0.9981372	0.0018628
2.30	0.9988568	0.0011432
2.40	0.9993115	0.0006885
2.50	0.9995930	0.0004070
2.60	0.9997640	0.0002360
2.70	0.9998657	0.0001343
2.80	0.9999250	0.0000750
2.90	0.9999589	0.0000411
3.00	0.9999779	0.0000221