

## JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -1 EXAMINATION- Sept. 2017

M.Tech. III Semester

COURSE CODE: 15M3WCE311

MAX. MARKS: 15

COURSE NAME: Environmental Geotechnics

COURSE CREDITS: 3

MAX. TIME: One Hr

*Note: All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means.*

[1] At a landfill site, leachate accumulated over a 0.3m thick clay liner contains chloride concentration of 1000 mg/L having free – solution diffusion coefficient of  $20.3 \times 10^{-10}$  m<sup>2</sup>/s. If the tortuosity is equal to 0.5, what would be the concentration of chloride at a depth of 3m after 100 years of diffusion? Neglect the effect of advection. Refer Table1.

[6]

[2] Estimate the time travel for the following contaminants from the source area to a water well located 100 m away in an aquifer with bulk density of soil = 1.5 g/cm<sup>3</sup>, n = 40%, organic carbon = 1%:

(i) Chloride ion (non- absorbing)

(ii) Ethylene

The water solubility of Ethylene is given as 131 mg/L. The ground water velocity is 10 m/yr.

[2+3 =5]

[3] Derive the equation for transient state flow in saturated soil condition.

[4]

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