Reg.No

B. E / B. Tech. (Full Time) DEGREE END SEMESTER EXAMINATIONS OCT/NOV 2011

AGRICULTURAL AND IRRIGATION ENGINEERING BRANCH

SIXTH SEMESTER

AI 93 53 DRAINAGE ENGINEERING AND LAND MANAGEMENT

(REGULATION 2008)

TIME: 3 HOURS Max Mark: 100

Instructions: Necessary tables are given in the question paper

Answer ALL Questions

Part A (10 x 2 = 20 Marks)

1. List the causes of waterlogging and salinisation
2. What is meant by leaching and what are the benefits of it?
3. Sketch diagrams for (i) unsteady flow into a drain having three flow components (ii) unsteady flow into drain with equivalent depth
4. Define tube well drainage
5. Write the water balance equation of the unsaturated zone.
6. What are the positive effects due to removal of excess subsurface water?
7. State the purpose of interceptor drains.
8. Under which circumstances a mole drainage system is preferrred?
9. Write the equation which relates Leaching Requirement and Climatological data.
10. Differentiate conventional drainage and Biodrainage

Part B (5 x 16 = 80 MARKS)

(Question No. 11 is compulsory)

11. a. (i) In an irrigated area, a drainage system is needed to control the watertable under the following conditions. The maximum permissible height of the watertable is 1 m below the soil surface; Irrigation water is applied every 10 days, and the field application losses percolating to the watertable are 25 mm for each irrigation. Drains are installed at a depth of 1.8 m; PVC drainpipes with a radius of 0.10 m are used. The depth of the impervious layer is 9.5 m below the soil surface; the average hydraulic conductivity of the soil is 1.0m/d, and the drainable pore space is 0.05. Calculate the drain spacing in an indirect way by converting the unsteady-state drainage criterion h_o/h_t, into a steady-state criterion q/h. (16)

12. a. (i) Explain the methods of measuring depth of water, dissolved salts , electrical conductivity in the agricultural field and how are these related to land drainage (16)

OR

12. b. (i) Spatial distribution of seepage depends on the leakage factor of the aquifer - Justify (8)

Reg.No | | | | | | | | |

(ii) State the assumptions and derive the Dupuit-Forchheimer equation for steady flow in unconfined aquifer (8)

13. a (i) With the help of a neat sketch classify the agricultural drainage systems and explain the conditions under which these systems are used (16)

OR

13. b. (i) Explain in detail the methodologies adopted in drainage surveying before implementing any drainage systems (16)

14. a. (i) Soil physical, chemical/ biological and hydrological interactions affect the field drainage system and crop production – Discuss (16)

OR

14. b. (i) Explain with a neat sketch, about any six tile drainage systems that can be laid for removing excess water from the field (6)

(ii) Design a drainage channel for a catchment area of 100 ha , slope 0.45%, coefficient of runoff 0.70, intensity of rainfall 4cm/hr, coefficient of rugosity 0.025 (10)

15. a. (i) Write a note on As-Built data and how would it be useful for a drainage Engineer (8)

(ii) Derive an expression for the salt balance of the root zone (8)

OR

15. b (i) Discuss the various design considerations of the biodrainage systems and how it is different from that of a conventional drainage system (10)

(ii) Crop growth is affected by soil salinity and sodicity – Discuss (6)

Table 8.1 Values for the equivalent depth d of Hooghoudt for r_0 = 0.1 m, D and L in m (Hooghoudt 1940)

L →	5 m	7.5	10	15	20	25	30	35	40	45	50	L →	50	75	80	85	90	100	150	200	250
D												D									
0.5 m	0.47	0.48	0.49	0.49	0.49	0 50	0.50	0.50	0.50	0 50	0.50	0.5	0.50	0.50	0.50	0.50	0.50	0.50	0 50	0.50	0.50
0.75	0.60	0.65	0.69	0.71	0.73	0.74	0.75	0 75	0.75	0.76	0.76	1	0 96	0.97	0 97	0.97	0.98	0.98	0.99	0.99	0.99
1.00	0.67	0.75	0.80	0.86	0.89	0.91	0.93	0.94	0.96	0.96	0.96	2	1.72	1.80	1.82	1.82	1.83	1.85	1.00	1.92	1.94
1.25	0.70	0.82	0.89	1.00	1.05	1.09	1.12	1.13	1.14	1 14	1.15	3	2.29	2.49	2 52	2.54	2.56	2 60	2.72	2.70	2.83
1.50	0.70	0.88	0.97	1.11	1.19	1.25	1.28	1.31	1.34	1.35	1.36	4	2.71	3.04	3 08	3.12	3.16	3.24	3.46	3.58	3.66
1.75	0.70	0.91	1 02	1.20	1.30	1.39	1.45	1.49	1.52	1.55	1.57	5	3.02	3.49	3 55	3.61	3.67	3 78	4.12	4.31	4.43
2 00	0 70	0 91	1 08	1.28	1 41	1.5	1 57	1.62	1 66	1 70	1.72	6	3.23	3.85	3 93	4 00	4 08	4 23	4 70	4.97	5 15
2 25	0 70	0 91	1 13	1 34	1 50	1 69	1 69	1 76	1 81	1.84	1 86	7	3 43	4.14	4 23	4.33	4 42	4 62	5.22	5 57	5.81
2 50	0 70	0 91	1.15	1.38	1.57	1 69	1 79	1 87	1 94	1 99	2 02	8	3 56	4 38	4 49	4 61	4.72	4 95	5.68	6.13	6.43
2 75	0 70	0 91	1.13	1 42	1.63	1 76	1 88	1.98	2.05	2 12	2.18	9	3.66	4.57	4.70	4.82	4.95	5.23	6.09	6.63	7.00
3.00	0 70	0 91	1.13	1 45	1 67	1.83	1 97	2 08	2.16	2 23	2 29	10	3.74	4 74	4 89	5.04	5 18	5.47	6.45	7.09	7.53
3.25	0 70	0 91	1 13	1.48	1 71	1 88	2 04	2 16	2.26	2.35	2.42	12 5	3 74	5 02	5.20	5 38	5 56	5.92	7.20	8.06	8 68
3.50	0 70	0.91	1 13	1.50	1 75	1 93	2.11	2.24	2.35	2.45	2.54	15	3.74	5.20	5 40	5.60	5.80	6.25	7 77	8.84	9.64
3.75	0.70	0.91	1.13	1.52	1.78	1.97	2.17	2.31	2.44	2.54	2.64	17.5	3.74	5.30	5.53	5.76	5.99	6 44	8.20	9.47	10.4
4.00	0.70	0.91	1.13	1.52	1.81	2.02	2.22	2 37	2.51	2.62	2.71	20	3.74	5.30	5.62	5.87	6.12	6.60	8.54	9 97	11.1
4.50	0.70	0.91	1.13	1.52	1.85	2.08	2.31	2.50	2.63	2.76	2.87	25	3.74	5.30	5.74	5.96	6.20	6.79	8.99	10 7	12.1
5.00	0.70	0.91	1.13	1 52	1.88	2.15	2.38	2.58	2.75	2 89	3.02	30	3.74	5.30	5 74	5.96	6.20	6.79	9.27	11.3	12.9
5.50	0.70	0 91	1.13	1.52	1.88	2.20	2.43	2.65	2.84	3 00	3.15	35	3.74	5.30	5.74	5.96	6.20	6 79	9.44	11.6	13.4
6.00	0.70	0.91	1.13	1.52	1.88	2.20	2 48	2 70	2.92	3.09	3 26	40	3.74	5.30	5 74	5 96	6.20	6.79	9.44	11.8	13 8
7.00	0.70	0 91	1.13	1.52	1.88	2.20	2.54	2.81	3.03	3.24	3 43	45	3.74	5.30	5.74	5.96	6.20	6.79	9.44	12.0	13.8
8.00	0.70	0.91	1.13	1.52	1.88	2.20	2.57	2.85	3.13	3.35	3 56	50	3.74	5.30	5 74	5.96	6.20	6.79	9.44	12.1	14.3
9.00	0.70	0.91	1.13	1 52	1.88	2.20	2.57	2.89	3.18	3.43	3.66	60	3 74	5.30	5.74	5.96	6.20	6.79	9.44	12.1	14.6
10.00	0.70	0.91	1.13	1.52	1.88	2.20	2.57	2 89	3.23	3.48	3.74	∞	3.88	5.38	5 76	6.00	6.26	6.82	9.55	12.2	14.7
∞	0.71	0.93	1.14	1.53	1.89	2.24	2.58	2.91	3.24	3.56	3.88										

3/3