

等 別：高等考試

類 科：水利工程技師

科 目：水利工程（包括海岸工程、防洪工程與排水工程）

考試時間：2 小時

座號：_____

※注意：(一)可以使用電子計算器。

(二)不必抄題，作答時請將試題題號及答案依照順序寫在試卷上，於本試題上作答者，不予計分。

(三)本試題之相關公式、物理常數、符號意義及設計參數未提及時，請自行合理推斷與假設。

- 一、請說明碎波研究在海岸工程上之重要性為何。（10 分）
- 二、設有一階梯式水深之海岸，其水深 d 及其所對應折射圖之波向線間隔及波浪行進間各段之摩擦損失係數 K_0 資料如表 2-1 所示，設水深 24 m 時入射波波高 $H_0 = 5$ m，週期為 7 秒，摩擦係數 $f = 0.02$ ，請依表 2-1 至 2-4 計算各水深（22、21、20、19 m）之波高，其中 L 為波長， L_0 為深海波波長， H/H_0 為淺化（shoaling）係數。（20 分）
- 三、若欲利用提高水田田埂高度，將水田地作為滯洪區，請詳細說明需有何種調查資料以及如何評估其防災之效益。（20 分）
- 四、設某集水區降雨強度 $I = 7748/(t+46.22)$ mm/hr， t (min) 為集流時間。若該集水區面積為 5 公頃，該區最高點與最低點之高程差為 20 m，河川長度為 300 m，其漫地流平均流動距離為 30 m，漫地流速為 0.45 m/sec，請以合理化公式估算該降雨強度下之洪水流量，其中逕流係數 $C = 0.85$ 。並請說明合理化公式適用之條件。（20 分）
- 五、設有一正方形斷面之箱涵，其寬度為 3 m，設計水深為 2.5 m，曼寧係數 $n = 0.015$ ，箱涵坡度 $S = 0.01$ ，請計算其通水量。並請說明箱涵排水在設計上需注意及考慮之事項。（20 分）
- 六、請說明何謂總合治水及為何需要之理由。（10 分）

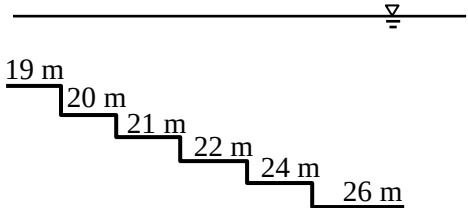
（請接第二頁）

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表 2-1



水深(m)	波向線間隔 (m)	波浪摩擦損失 係數 K_0
26	2.20	1.000
24	2.10	0.970
22	1.90	0.950
21	1.85	0.945
20	2.20	0.940
19	2.00	0.930

表 2-3

d/L_o	d/L	$2\pi d/L$	n	C_G/C_o	H/H_o
.2600	.2766	1.738	.6076	.5712	.9356
.2610	.2775	1.744	.6068	.5707	.9360
.2620	.2784	1.749	.6060	.5703	.9363
.2630	.2792	1.755	.6052	.5699	.9367
.2640	.2801	1.760	.6043	.5695	.9370
.2650	.2810	1.766	.6035	.5691	.9373
.2660	.2819	1.771	.6027	.5687	.9377
.2670	.2827	1.776	.6018	.5683	.9380
.2680	.2836	1.782	.6010	.5679	.9383
.2690	.2845	1.788	.6002	.5675	.9386
.2700	.2854	1.793	.5994	.5671	.9390
.2710	.2863	1.799	.5986	.5667	.9393
.2720	.2872	1.804	.5978	.5663	.9396
.2730	.2880	1.810	.5971	.5659	.9400
.2740	.2889	1.815	.5963	.5655	.9403
.2750	.2898	1.821	.5955	.5651	.9406
.2760	.2907	1.826	.5947	.5647	.9410
.2770	.2916	1.832	.5940	.5643	.9413
.2780	.2924	1.837	.5932	.5639	.9416
.2790	.2933	1.843	.5925	.5635	.9420
.2800	.2942	1.849	.5917	.5631	.9423
.2810	.2951	1.854	.5910	.5627	.9426
.2820	.2960	1.860	.5902	.5623	.9430
.2830	.2969	1.866	.5895	.5619	.9433
.2840	.2978	1.871	.5887	.5615	.9436
.2850	.2987	1.877	.5880	.5611	.9440
.2860	.2996	1.882	.5873	.5607	.9443
.2870	.3005	1.888	.5866	.5603	.9446
.2880	.3014	1.893	.5859	.5600	.9449
.2890	.3022	1.899	.5852	.5596	.9452
.2900	.3031	1.905	.5845	.5592	.9456
.2910	.3040	1.910	.5838	.5588	.9459
.2920	.3049	1.916	.5831	.5584	.9463
.2930	.3058	1.922	.5824	.5580	.9466
.2940	.3067	1.927	.5817	.5576	.9469

表 2-2

d/L_o	d/L	$2\pi d/L$	n	C_G/C_o	H/H_o
.2250	.2463	1.548	.6404	.5850	.9245
.2260	.2472	1.553	.6394	.5846	.9248
.2270	.2481	1.559	.6383	.5842	.9251
.2280	.2489	1.564	.6373	.5838	.9254
.2290	.2498	1.569	.6363	.5834	.9258
.2300	.2506	1.575	.6353	.5830	.9261
.2310	.2515	1.580	.6343	.5826	.9264
.2320	.2523	1.585	.6333	.5823	.9267
.2330	.2532	1.591	.6323	.5819	.9270
.2340	.2540	1.596	.6313	.5815	.9273
.2350	.2549	1.602	.6304	.5811	.9276
.2360	.2558	1.607	.6294	.5807	.9279
.2370	.2566	1.612	.6284	.5804	.9282
.2380	.2575	1.618	.6275	.5800	.9285
.2390	.2584	1.623	.6265	.5796	.9288
.2400	.2592	1.629	.6256	.5792	.9291
.2410	.2601	1.634	.6246	.5788	.9294
.2420	.2610	1.640	.6237	.5784	.9298
.2430	.2618	1.645	.6228	.5780	.9301
.2440	.2627	1.650	.6218	.5776	.9304
.2450	.2635	1.656	.6209	.5772	.9307
.2460	.2644	1.661	.6200	.5768	.9310
.2470	.2653	1.667	.6191	.5764	.9314
.2480	.2661	1.672	.6182	.5760	.9317
.2490	.2670	1.678	.6173	.5756	.9320
.2500	.2679	1.683	.6164	.5752	.9323
.2510	.2687	1.689	.6155	.5748	.9327
.2520	.2696	1.694	.6146	.5744	.9330
.2530	.2705	1.700	.6137	.5740	.9333
.2540	.2714	1.705	.6128	.5736	.9336
.2550	.2722	1.711	.6120	.5732	.9340
.2560	.2731	1.716	.6111	.5728	.9343
.2570	.2740	1.722	.6102	.5724	.9346
.2580	.2749	1.727	.6093	.5720	.9349
.2590	.2757	1.732	.6085	.5716	.9353

表 2-4

d/L_o	d/L	$2\pi d/L$	n	C_G/C_o	H/H_o
.2950	.3076	1.933	.5810	.5572	.9473
.2960	.3085	1.938	.5804	.5568	.9476
.2970	.3094	1.944	.5797	.5564	.9480
.2980	.3103	1.950	.5790	.5560	.9483
.2990	.3112	1.955	.5784	.5556	.9486
.3000	.3121	1.961	.5777	.5552	.9490
.3010	.3130	1.967	.5771	.5549	.9493
.3020	.3139	1.972	.5764	.5545	.9496
.3030	.3148	1.978	.5758	.5541	.9499
.3040	.3157	1.984	.5751	.5538	.9502
.3050	.3166	1.989	.5745	.5534	.9505
.3060	.3175	1.995	.5739	.5530	.9509
.3070	.3184	2.001	.5732	.5527	.9512
.3080	.3193	2.007	.5726	.5523	.9515
.3090	.3202	2.012	.5720	.5519	.9518
.3100	.3211	2.018	.5714	.5515	.9522
.3110	.3220	2.023	.5708	.5511	.9525
.3120	.3230	2.029	.5701	.5507	.9528
.3130	.3239	2.035	.5695	.5504	.9531
.3140	.3248	2.041	.5689	.5500	.9535
.3150	.3257	2.046	.5683	.5497	.9538
.3160	.3266	2.052	.5678	.5494	.9541
.3170	.3275	2.058	.5672	.5490	.9544
.3180	.3284	2.063	.5666	.5486	.9547
.3190	.3294	2.069	.5660	.5483	.9550
.3200	.3302	2.075	.5655	.5479	.9553
.3210	.3311	2.081	.5649	.5476	.9556
.3220	.3321	2.086	.5643	.5472	.9559
.3230	.3330	2.092	.5637	.5468	.9562
.3240	.3339	2.098	.5632	.5465	.9565
.3250	.3349	2.104	.5627	.5462	.9568
.3260	.3357	2.110	.5621	.5458	.9571
.3270	.3367	2.115	.5616	.5455	.9574
.3280	.3376	2.121	.5610	.5451	.9577
.3290	.3385	2.127	.5605	.5448	.9580