

國立高雄應用科技大學
九十八學年度碩士班招生考試
土木工程與防災科技研究所（丁組）

准考證號碼 （考生必須填寫）

工程統計

試題 共 3 頁，第 1 頁

注意：a. 本試題共六題，共 100 分。

b. 作答時不必抄題。

c. 考生作答前請詳閱答案卷之考生注意事項。

- 一、某一工程某天欲澆置混凝土 500 m^3 ，每輛預拌混凝土車裝 4 m^3 ，依施工合約規定每 100 m^3 須抽樣製作一組抗壓試體，今甲方監工獲得 0.149、0.511、0.475、0.854、0.678 五個隨機數，請分別以簡單隨機抽樣、分層隨機抽樣及系統抽樣法等三種方法進行取樣，此三種方法應抽驗之車數各為第幾車？(15%)
- 二、ACI 混凝土配合設計中定義 f_c' 為設計強度， f_{cr}' 為要求平均強度，若以往類似配比之抗壓強度標準差為 S ，請以繪圖及文字敘述的方法詳細回答下列問題：(15%)
 - a. 若 $f_c' = f_{cr}'$ ，則混凝土強度試驗的不合率有多少？
 - b. 若要求任一組混凝土強度試驗結果須大於 f_c' 的不合格率低於 1%，請問 f_{cr}' 應為多少？
 - c. 若要求任何連續 5 組混凝土強度平均值的結果須大於 f_c' 的不合格率低於 1%，請問 f_{cr}' 應為多少？
- 三、假設一預拌混凝土廠所生產混凝土強度的標準偏差為 20 kgf/cm^2 ，現隨機取 36 個混凝土試體，得到強度的平均值為 360 kgf/cm^2 ，請計算此拌合廠所生產混凝土強度平均值 95% 的信賴區間？若現要求混凝土強度平均值 90% 信賴區間的誤差為 $\pm 5 \text{ kgf/cm}^2$ ，請問共應取多少混凝土試體？(10%)
- 四、作用於一結構物之力的延時 T 為一隨機變數，其機率密度函數 PDF (probability density function) 如圖 1 所示，
 - a. 求 a 與 b 的適當值。(10%)
 - b. 求 T 的平均值與中位數。(5%)
 - c. 求 T 大於 10 秒的機率 $P(T \geq 10)$ 。(5%)

【背面尚有題】

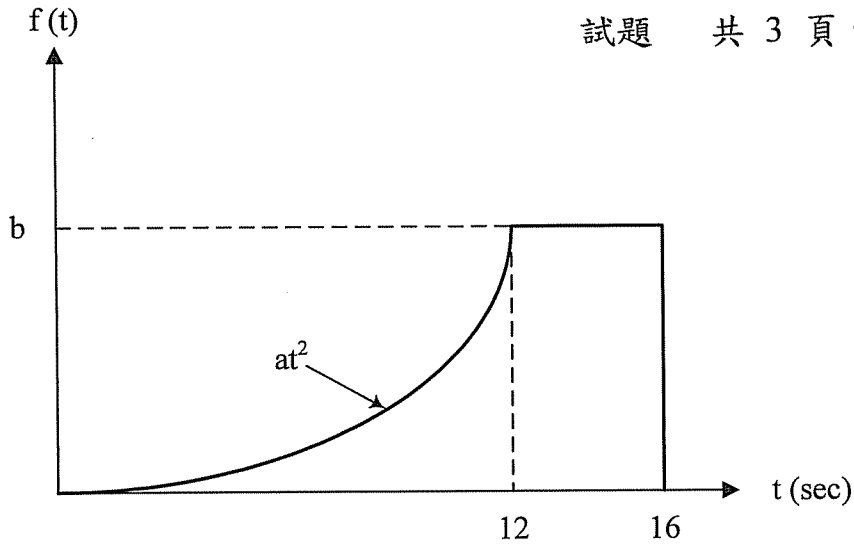
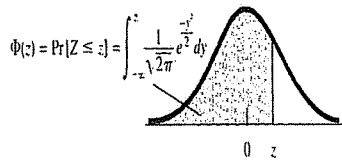


圖1 荷重作用力之PDF

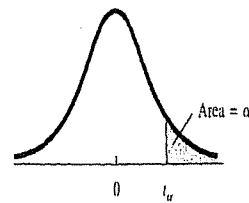
五、下表為某位化學工程師欲研究某成品重量(公斤)Y 與某液體原料體積(公升)X 間關係所的試驗值，以最小平方法所得之迴歸方程式為 $Y = 22.405 + 3.619X$ 。

X	Y
14	68
23	105
9	40
17	79
10	81
22	95
5	31
12	72
6	45
16	93

- 迴歸方程式 $Y = 22.405 + 3.619X$ 中 3.619 代表的意義為何？(5%)
 - 計算成品重量(Y)之估計的標準誤(standard error of the estimate)=？(5%)
 - 計算此資料的相關係數(correlation coefficient)=？(5%)
 - 計算此資料的判定係數(coefficient of determination)？Y 的總變異可由 X 解釋所佔的百分比=？(10%)
- 六、某混凝土供應商宣稱其混凝土抗壓強度為 32.4 MPa，標準差為 2.8 MPa。今隨機抽樣製作了 16 個試體，其抗壓強度平均值為 30.3 MPa，請問在顯著水準 0.05 下，您相信此混凝土供應商的說詞嗎？為什麼？ (15%)



附圖1
常態分配表



附圖2
t分配表

Normal Deviate z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
-4.0	.00003									
-3.2	.0007	.0007	.0006	.0006	.0006	.0006	.0006	.0005	.0005	.0005
-3.1	.0010	.0009	.0009	.0009	.0008	.0008	.0008	.0008	.0007	.0007
-3.0	.0014	.0013	.0013	.0012	.0012	.0011	.0011	.0011	.0010	.0010
-2.9	.0019	.0018	.0018	.0017	.0016	.0016	.0015	.0015	.0014	.0014
-2.8	.0026	.0025	.0024	.0023	.0023	.0022	.0021	.0021	.0020	.0019
-2.7	.0035	.0034	.0033	.0032	.0031	.0030	.0029	.0028	.0027	.0026
-2.6	.0047	.0045	.0044	.0043	.0041	.0040	.0039	.0038	.0037	.0036
-2.5	.0062	.0060	.0059	.0057	.0055	.0054	.0052	.0051	.0049	.0048
-2.4	.0082	.0080	.0078	.0075	.0073	.0071	.0069	.0068	.0066	.0064
-2.3	.0107	.0104	.0102	.0099	.0096	.0094	.0091	.0089	.0087	.0084
-2.2	.0139	.0136	.0132	.0129	.0125	.0122	.0119	.0116	.0113	.0110
-2.1	.0179	.0174	.0170	.0166	.0162	.0158	.0154	.0150	.0146	.0143
-2.0	.0228	.0222	.0217	.0212	.0207	.0202	.0197	.0192	.0188	.0183
-1.9	.0287	.0281	.0274	.0268	.0262	.0256	.0250	.0244	.0239	.0233
-1.8	.0359	.0351	.0344	.0336	.0329	.0322	.0314	.0307	.0301	.0294
-1.7	.0446	.0436	.0427	.0418	.0409	.0401	.0392	.0384	.0375	.0367
-1.6	.0548	.0537	.0526	.0516	.0505	.0495	.0485	.0475	.0465	.0455
-1.5	.0668	.0655	.0643	.0630	.0618	.0606	.0594	.0582	.0571	.0559
-1.4	.0808	.0793	.0778	.0764	.0749	.0735	.0721	.0708	.0694	.0681
-1.3	.0968	.0951	.0934	.0918	.0901	.0885	.0869	.0853	.0838	.0823
-1.2	.1151	.1131	.1112	.1093	.1075	.1056	.1038	.1020	.1003	.0985
-1.1	.1357	.1335	.1314	.1292	.1271	.1251	.1230	.1210	.1190	.1170
-1.0	.1587	.1562	.1539	.1515	.1492	.1469	.1446	.1423	.1401	.1379
-0.9	.1841	.1814	.1788	.1762	.1736	.1711	.1685	.1660	.1635	.1611
-0.8	.2119	.2090	.2061	.2033	.2005	.1977	.1949	.1922	.1894	.1867
-0.7	.2420	.2388	.2358	.2327	.2296	.2266	.2236	.2206	.2177	.2148
-0.6	.2743	.2709	.2676	.2643	.2611	.2578	.2546	.2514	.2482	.2451
-0.5	.3085	.3050	.3015	.2981	.2946	.2912	.2877	.2843	.2810	.2776
-0.4	.3446	.3409	.3372	.3336	.3300	.3264	.3228	.3192	.3156	.3121
-0.3	.3821	.3783	.3745	.3707	.3669	.3632	.3594	.3557	.3520	.3483
-0.2	.4207	.4168	.4129	.4090	.4052	.4013	.3974	.3936	.3897	.3859
-0.1	.4602	.4562	.4522	.4483	.4443	.4404	.4364	.4325	.4286	.4247
-0.0	.5000	.4960	.4920	.4880	.4840	.4801	.4761	.4721	.4681	.4641

The following table provides the values of t_{α} that correspond to a given upper-tail area α and a specified number of degrees of freedom.

Degrees of Freedom	Upper-Tail Area α									
	.4	.25	.1	.05	.025	.01	.005	.0025	.001	.0005
1	.325	1.000	3.078	6.314	12.706	31.821	63.657	127.32	318.31	636.62
2	.289	.816	1.886	2.920	4.303	6.965	9.925	14.089	22.327	31.598
3	.277	.765	1.638	2.353	3.182	4.541	5.841	7.453	10.214	12.924
4	.271	.741	1.533	2.132	2.776	3.747	4.604	5.598	7.173	8.610
5	.267	.727	1.476	2.015	2.571	3.365	4.032	4.773	5.893	6.869
6	.265	.718	1.440	1.943	2.447	3.143	3.707	4.317	5.208	5.959
7	.263	.711	1.415	1.895	2.365	2.998	3.499	4.029	4.785	5.408
8	.262	.706	1.397	1.860	2.306	2.896	3.355	3.833	4.501	5.041
9	.261	.703	1.383	1.833	2.262	2.821	3.250	3.690	4.297	4.781
10	.260	.700	1.372	1.812	2.228	2.764	3.169	3.581	4.144	4.587
11	.260	.697	1.363	1.796	2.201	2.718	3.106	3.497	4.025	4.437
12	.259	.695	1.356	1.782	2.179	2.681	3.055	3.428	3.930	4.318
13	.259	.694	1.350	1.771	2.160	2.650	3.012	3.372	3.852	4.221
14	.258	.692	1.345	1.761	2.145	2.624	2.977	3.326	3.787	4.140
15	.258	.691	1.341	1.753	2.131	2.602	2.947	3.286	3.733	4.073
16	.258	.690	1.337	1.746	2.120	2.583	2.921	3.252	3.686	4.015
17	.257	.689	1.333	1.740	2.110	2.567	2.898	3.222	3.646	3.965
18	.257	.688	1.330	1.734	2.101	2.552	2.878	3.197	3.610	3.922
19	.257	.688	1.328	1.729	2.093	2.539	2.861	3.174	3.579	3.883
20	.257	.687	1.325	1.725	2.086	2.528	2.845	3.153	3.552	3.850
21	.257	.686	1.323	1.721	2.080	2.518	2.831	3.135	3.527	3.819
22	.256	.686	1.321	1.717	2.074	2.508	2.819	3.119	3.505	3.792
23	.256	.685	1.319	1.714	2.069	2.500	2.807	3.104	3.485	3.767
24	.256	.685	1.318	1.711	2.064	2.492	2.797	3.091	3.467	3.745
25	.256	.684	1.316	1.708	2.060	2.485	2.787	3.078	3.450	3.725
26	.256	.684	1.315	1.706	2.056	2.479	2.779	3.067	3.435	3.707
27	.256	.684	1.314	1.703	2.052	2.473	2.771	3.057	3.421	3.690
28	.256	.683	1.313	1.701	2.048	2.467	2.763	3.047	3.408	3.674
29	.256	.683	1.311	1.699	2.045	2.462	2.756	3.038	3.396	3.659
30	.256	.683	1.310	1.697	2.042	2.457	2.750	3.030	3.385	3.646
40	.255	.681	1.303	1.684	2.021	2.423	2.704	2.971	3.307	3.551
60	.254	.679	1.296	1.671	2.000	2.390	2.660	2.915	3.232	3.460
120	.254	.677	1.289	1.658	1.980	2.358	2.617	2.860	3.160	3.373
∞	.253	.674	1.282	1.645	1.960	2.326	2.576	2.807	3.090	3.291