



本試題共八題，合計 100 分，請依題號作答並將答案寫在答案卷上，違者不予計分。

1. The probability of a customer arrival at a grocery service counter in any 1 second is equal to 0.15. Assume that customers arrive in a random stream and hence that the arrival any 1 second is independent of any other.
- (a) Find the probability that the first arrival will occur during the third 1-second interval. (5%)
- (b) Find the probability that the first arrival will not occur until at least the third 1-second interval. (5%)

2. Let the moment-generating function for  $Y$  be  $m(t) = \frac{1}{6}e^t + \frac{2}{6}e^{2t} + \frac{3}{6}e^{3t}$ . Find the distribution of  $Y$  and its expected value and variance. (10%)

3. As a measure of intelligence, mice are timed when going through a maze to reach a reward of food. The time(in seconds) required for any mouse is a random variable  $Y$  with density function given by

$$f(y) = \begin{cases} \frac{b}{y^2} & y \geq b \\ 0 & \text{elsewhere} \end{cases}$$

where  $b$  is the minimum possible time needed to traverse the maze.

- (a) Show that  $f(y)$  has the properties of a density function. (5%)
- (b) Find  $F(y)$ . (3%)
- (c) Find  $P(Y > b + c)$  for a positive constant  $c$ . (2%)
4. A soft drink machine can be regulated so that it discharges an average of  $\mu$  ounces per cup. If the ounces of fill are normally distributed with standard deviation of 0.3 ounce, give the setting for  $\mu$  so that 8-ounce cups will overflow 1% of the time. (10%)
5. The length of life(measured in hundreds of hours)  $Y$  for fuses of a certain type is modeled by the exponential distribution, with

$$f(y) = \begin{cases} \left(\frac{1}{3}\right)e^{-y/3} & y > 0 \\ 0 & \text{elsewhere} \end{cases}$$

- (a) If two such fuses have independent lengths of life,  $Y_1$  and  $Y_2$ , find the joint probability density function for  $Y_1$  and  $Y_2$ . (5%)
- (b) One fuse in (a) is in a primary system and the other is in a backup system that comes into use only if the primary system fails. The total effective length of life of the two fuses is then  $Y_1 + Y_2$ . Find  $P(Y_1 + Y_2 \leq 1)$ . (5%)



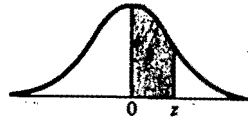
6. (a) 為了解製程中某一品質特性，從製程中抽取了 25 組樣組，每組取樣 5 個樣本，得到 25 組樣組的平均值為 31.0，標準差為 2.0。假設此品質特性值符合常態分配，若欲檢定此平均值是否等於目標值 30.0，請求出允許 0.27% 型一誤差 (type I error) 的臨界值 (critical value)。(10%)
- (b) 若此一品質特性值之標準差為 1.0，今再次取樣 5 個樣本，得到平均值為 31.0，請問在 1% 的型一誤差 (type I error) 下，檢定製程此時 (抽取此 5 個樣本時) 的品質特性值之平均值是否等於目標值 30.0？(15%)
7. 為了解原料成份對品質特性的影響，工程師針對原料中的一個成份，研究三種調配比例 A、B、C，經各自實驗五次的結果如下表，請問不同的調配比例是否會影響此品質特性值之平均值？假設前述資料符合變異數分析的各項假設， $\alpha=0.01$ 。(15%)

調配比例	A					B					C				
平均值	30.5	30.7	30.9	31.1	30.2	29.8	30.4	29.9	30.3	30.6	31.1	31.0	31.2	31.2	30.9

8. 有關最近熱門的進口肉品的話題，某報導聲稱反對變更進口辦法的比率多過贊成的，因為根據其訪談 1000 人次的結果，有 382 人贊成變更進口的辦法，416 人不贊成，其餘的沒有意見。請以統計學的觀點，檢查此報導的立論是否合宜， $\alpha=0.05$ 。(10%)



TABLE 3 Normal Curve Areas



z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
0.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2517	.2549
0.7	.2580	.2611	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.9	.4981	.4982	.4982	.4983	.4983	.4984	.4984	.4985	.4985	.4986
3.0	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990

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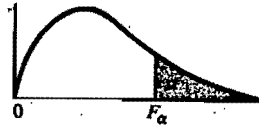
TABLE 4 Critical Values of t



	$t_{.100}$	$t_{.050}$	$t_{.025}$	$t_{.010}$	$t_{.005}$	d.f.
	3.078	6.314	12.706	31.821	63.657	1
	1.886	2.920	4.303	6.965	9.925	2
	1.638	2.353	3.182	4.541	5.841	3
	1.533	2.132	2.776	3.747	4.604	4
	1.476	2.015	2.571	3.365	4.032	5
	1.440	1.943	2.447	3.143	3.707	6
	1.415	1.895	2.365	2.998	3.499	7
	1.397	1.860	2.306	2.896	3.355	8
	1.383	1.833	2.262	2.821	3.250	9
	1.372	1.812	2.228	2.764	3.169	10
	1.363	1.796	2.201	2.718	3.106	11
	1.356	1.782	2.179	2.681	3.055	12
	1.350	1.771	2.160	2.650	3.012	13
	1.345	1.761	2.145	2.624	2.977	14
	1.341	1.753	2.131	2.602	2.947	15
	1.337	1.746	2.120	2.583	2.921	16
	1.333	1.740	2.110	2.567	2.898	17
	1.330	1.734	2.101	2.552	2.878	18
	1.328	1.729	2.093	2.539	2.861	19
	1.325	1.725	2.086	2.528	2.845	20
	1.323	1.721	2.080	2.518	2.831	21
	1.321	1.717	2.074	2.508	2.819	22
	1.319	1.714	2.069	2.500	2.807	23
	1.318	1.711	2.064	2.492	2.797	24
	1.316	1.708	2.060	2.485	2.787	25
	1.315	1.706	2.056	2.479	2.779	26
	1.314	1.703	2.052	2.473	2.771	27
	1.313	1.701	2.048	2.467	2.763	28
	1.311	1.699	2.045	2.462	2.756	29
	1.282	1.645	1.960	2.326	2.576	inf.

From "Table of Percentage Points of the t-Distribution." Computed by Maxine Merrington, *Biometrika*, Vol. 32 (1941), p. 300. Reproduced by permission of Professor E. S. Pearson.

TABLE 6 Percentage Points of the F Distribution;  $\alpha = .05$



$v_2$ (d.f.)	$v_1$ (d.f.)								
	1	2	3	4	5	6	7	8	9
1	161.4	199.5	215.7	224.6	230.2	234.0	236.8	238.9	240.5
2	18.51	19.00	19.16	19.25	19.30	19.33	19.35	19.37	19.38
3	10.13	9.55	9.28	9.12	9.01	8.94	8.89	8.85	8.81
4	7.71	6.94	6.59	6.39	6.26	6.16	6.09	6.04	6.00
5	6.61	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.77
6	5.99	5.14	4.76	4.53	4.39	4.28	4.21	4.15	4.10
7	5.59	4.74	4.35	4.12	3.97	3.87	3.79	3.73	3.68
8	5.32	4.46	4.07	3.84	3.69	3.58	3.50	3.44	3.39
9	5.12	4.26	3.86	3.63	3.48	3.37	3.29	3.23	3.18
10	4.96	4.10	3.71	3.48	3.33	3.22	3.14	3.07	3.02
11	4.84	3.98	3.59	3.36	3.20	3.09	3.01	2.95	2.90
12	4.75	3.89	3.49	3.26	3.11	3.00	2.91	2.85	2.80
13	4.67	3.81	3.41	3.18	3.03	2.92	2.83	2.77	2.71
14	4.60	3.74	3.34	3.11	2.96	2.85	2.76	2.70	2.65
15	4.54	3.68	3.29	3.06	2.90	2.79	2.71	2.64	2.59
16	4.49	3.63	3.24	3.01	2.85	2.74	2.66	2.59	2.54
17	4.45	3.59	3.20	2.96	2.81	2.70	2.61	2.55	2.49
18	4.41	3.55	3.16	2.93	2.77	2.66	2.58	2.51	2.46
19	4.38	3.52	3.13	2.90	2.74	2.63	2.54	2.48	2.42
20	4.35	3.49	3.10	2.87	2.71	2.60	2.51	2.45	2.39
21	4.32	3.47	3.07	2.84	2.68	2.57	2.49	2.42	2.37
22	4.30	3.44	3.05	2.82	2.66	2.55	2.46	2.40	2.34
23	4.28	3.42	3.03	2.80	2.64	2.53	2.44	2.37	2.32
24	4.26	3.40	3.01	2.78	2.62	2.51	2.42	2.36	2.30
25	4.24	3.39	2.99	2.76	2.60	2.49	2.40	2.34	2.28
26	4.23	3.37	2.98	2.74	2.59	2.47	2.39	2.32	2.27
27	4.21	3.35	2.96	2.73	2.57	2.46	2.37	2.31	2.25
28	4.20	3.34	2.95	2.71	2.56	2.45	2.36	2.29	2.24
29	4.18	3.33	2.93	2.70	2.55	2.43	2.35	2.28	2.22
30	4.17	3.32	2.92	2.69	2.53	2.42	2.33	2.27	2.21
40	4.08	3.23	2.84	2.61	2.45	2.34	2.25	2.18	2.12
60	4.00	3.15	2.76	2.53	2.37	2.25	2.17	2.10	2.04
120	3.92	3.07	2.68	2.45	2.29	2.17	2.09	2.02	1.96
$\infty$	3.84	3.00	2.60	2.37	2.21	2.10	2.01	1.94	1.88

TABLE 6 (Continued)

$v_2$ (d.f.)	$v_1$ (d.f.)									
	10	12	15	20	24	30	40	60	120	$\infty$
1	241.9	243.9	245.9	248.0	249.1	250.1	251.1	252.2	253.3	254.3
2	19.40	19.41	19.43	19.45	19.45	19.46	19.47	19.48	19.49	19.50
3	8.79	8.74	8.70	8.66	8.64	8.62	8.59	8.57	8.55	8.53
4	5.96	5.91	5.86	5.80	5.77	5.75	5.72	5.69	5.66	5.63
5	4.74	4.68	4.62	4.56	4.53	4.50	4.46	4.43	4.40	4.36
6	4.06	4.00	3.94	3.87	3.84	3.81	3.77	3.74	3.70	3.67
7	3.64	3.57	3.51	3.44	3.41	3.38	3.34	3.30	3.27	3.23
8	3.35	3.28	3.22	3.15	3.12	3.08	3.04	3.01	2.97	2.93
9	3.14	3.07	3.01	2.94	2.90	2.86	2.83	2.79	2.75	2.71
10	2.98	2.91	2.85	2.77	2.74	2.70	2.66	2.62	2.58	2.54
11	2.85	2.79	2.72	2.65	2.61	2.57	2.53	2.49	2.45	2.40
12	2.75	2.69	2.62	2.54	2.51	2.47	2.43	2.38	2.34	2.30
13	2.67	2.60	2.53	2.46	2.42	2.38	2.34	2.30	2.25	2.21
14	2.60	2.53	2.46	2.39	2.35	2.31	2.27	2.22	2.18	2.13
15	2.54	2.48	2.40	2.33	2.29	2.25	2.20	2.16	2.11	2.07
16	2.49	2.42	2.35	2.28	2.24	2.19	2.15	2.11	2.06	2.01
17	2.45	2.38	2.31	2.23	2.19	2.15	2.10	2.06	2.01	1.96
18	2.41	2.34	2.27	2.19	2.15	2.11	2.06	2.02	1.97	1.92
19	2.38	2.31	2.23	2.16	2.11	2.07	2.03	1.98	1.93	1.88
20	2.35	2.28	2.20	2.12	2.08	2.04	1.99	1.95	1.90	1.84
21	2.32	2.25	2.18	2.10	2.05	2.01	1.96	1.92	1.87	1.81
22	2.30	2.23	2.15	2.07	2.03	1.98	1.94	1.89	1.84	1.78
23	2.27	2.20	2.13	2.05	2.01	1.96	1.91	1.86	1.81	1.76
24	2.25	2.18	2.11	2.03	1.98	1.94	1.89	1.84	1.79	1.73
25	2.24	2.16	2.09	2.01	1.96	1.92	1.87	1.82	1.77	1.71
26	2.22	2.15	2.07	1.99	1.95	1.90	1.85	1.80	1.75	1.69
27	2.20	2.13	2.06	1.97	1.93	1.88	1.84	1.79	1.73	1.67
28	2.19	2.12	2.04	1.96	1.91	1.87	1.82	1.77	1.71	1.65
29	2.18	2.10	2.03	1.94	1.90	1.85	1.81	1.75	1.70	1.64
30	2.16	2.09	2.01	1.93	1.89	1.84	1.79	1.74	1.68	1.62
40	2.08	2.00	1.92	1.84	1.79	1.74	1.69	1.64	1.58	1.51
60	1.99	1.92	1.84	1.75	1.70	1.65	1.59	1.53	1.47	1.39
120	1.91	1.83	1.75	1.66	1.61	1.55	1.50	1.43	1.35	1.25
$\infty$	1.83	1.75	1.67	1.57	1.52	1.46	1.39	1.32	1.22	1.00

From "Tables of Percentage Points of the Inverted Beta (F) Distribution," *Biometrika*, Vol. 33 (1946) pp. 73-88, by Maxine Merrington and Catherine M. Thompson. Reproduced by permission of Professor E. S. Pearson.



國立雲林科技大學  
101 學年度碩士班暨碩士在職專班招生考試試題

系所：工管系、資管系  
科目：統計學(1)

TABLE 7 Percentage Points of the F Distribution;  $\alpha = .01$  -



$v_2$ (d.f.)	$v_1$ (d.f.)								
	1	2	3	4	5	6	7	8	9
1	4052	4999.5	5403	5625	5764	5859	5928	5982	6022
2	98.50	99.00	99.17	99.25	99.30	99.33	99.36	99.37	99.39
3	34.12	30.82	29.46	28.71	28.24	27.91	27.67	27.49	27.35
4	21.20	18.00	16.69	15.98	15.52	15.21	14.98	14.80	14.66
5	16.26	13.27	12.06	11.39	10.97	10.67	10.46	10.29	10.16
6	13.75	10.92	9.78	9.15	8.75	8.47	8.26	8.10	7.98
7	12.25	9.55	8.45	7.85	7.46	7.19	6.99	6.84	6.72
8	11.26	8.65	7.59	7.01	6.63	6.37	6.18	6.03	5.91
9	10.56	8.02	6.99	6.42	6.06	5.80	5.61	5.47	5.35
10	10.04	7.56	6.55	5.99	5.64	5.39	5.20	5.06	4.94
11	9.65	7.21	6.22	5.67	5.32	5.07	4.89	4.74	4.63
12	9.33	6.93	5.95	5.41	5.06	4.82	4.64	4.50	4.39
13	9.07	6.70	5.74	5.21	4.86	4.62	4.44	4.30	4.19
14	8.86	6.51	5.56	5.04	4.69	4.46	4.28	4.14	4.03
15	8.68	6.36	5.42	4.89	4.56	4.32	4.14	4.00	3.89
16	8.53	6.23	5.29	4.77	4.44	4.20	4.03	3.89	3.78
17	8.40	6.11	5.18	4.67	4.34	4.10	3.93	3.79	3.68
18	8.29	6.01	5.09	4.58	4.25	4.01	3.84	3.71	3.60
19	8.18	5.93	5.01	4.50	4.17	3.94	3.77	3.63	3.52
20	8.10	5.85	4.94	4.43	4.10	3.87	3.70	3.56	3.46
21	8.02	5.78	4.87	4.37	4.04	3.81	3.64	3.51	3.40
22	7.95	5.72	4.82	4.31	3.99	3.76	3.59	3.45	3.35
23	7.88	5.66	4.76	4.26	3.94	3.71	3.54	3.41	3.30
24	7.82	5.61	4.72	4.22	3.90	3.67	3.50	3.36	3.26
25	7.77	5.57	4.68	4.18	3.85	3.63	3.46	3.32	3.22
26	7.72	5.53	4.64	4.14	3.82	3.59	3.42	3.29	3.18
27	7.68	5.49	4.60	4.11	3.78	3.56	3.39	3.26	3.15
28	7.64	5.45	4.57	4.07	3.75	3.53	3.36	3.23	3.12
29	7.60	5.42	4.54	4.04	3.73	3.50	3.33	3.20	3.09
30	7.56	5.39	4.51	4.02	3.70	3.47	3.30	3.17	3.07
40	7.31	5.18	4.31	3.83	3.51	3.29	3.12	2.99	2.89
60	7.08	4.98	4.13	3.65	3.34	3.12	2.95	2.82	2.72
120	6.85	4.79	3.95	3.48	3.17	2.96	2.79	2.66	2.56
$\infty$	6.63	4.61	3.78	3.32	3.02	2.80	2.64	2.51	2.41

TABLE 7 (Continued)

$v_2$ (d.f.)	$v_1$ (d.f.)									
	10	12	15	20	24	30	40	60	120	$\infty$
6056	99.40	99.42	99.43	99.45	99.46	99.47	99.47	99.48	99.49	99.50
6106	27.23	27.05	26.87	26.69	26.60	26.50	26.41	26.32	26.22	26.13
6157	14.55	14.37	14.20	14.02	13.93	13.84	13.75	13.65	13.56	13.46
6209	10.05	9.89	9.72	9.55	9.47	9.38	9.29	9.20	9.11	9.02
6235	7.87	7.72	7.56	7.40	7.31	7.23	7.14	7.06	6.97	6.88
6261	6.62	6.47	6.31	6.16	6.07	5.99	5.91	5.82	5.74	5.65
6287	5.81	5.67	5.52	5.36	5.28	5.20	5.12	5.03	4.95	4.86
6313	5.26	5.11	4.96	4.81	4.73	4.65	4.57	4.48	4.40	4.31
6339	4.85	4.71	4.56	4.41	4.33	4.25	4.17	4.08	4.00	3.91
6366	4.54	4.40	4.25	4.10	4.02	3.94	3.86	3.78	3.69	3.60
1	4.30	4.16	4.01	3.86	3.78	3.70	3.62	3.54	3.45	3.36
2	4.10	3.96	3.82	3.66	3.59	3.51	3.43	3.34	3.25	3.17
3	3.94	3.80	3.66	3.51	3.43	3.35	3.27	3.18	3.09	3.00
4	3.80	3.67	3.52	3.37	3.29	3.21	3.13	3.05	2.96	2.87
5	3.69	3.55	3.41	3.26	3.18	3.10	3.02	2.93	2.84	2.75
6	3.59	3.46	3.31	3.16	3.08	3.00	2.92	2.83	2.75	2.65
7	3.51	3.37	3.23	3.08	3.00	2.92	2.84	2.75	2.66	2.57
8	3.43	3.30	3.15	3.00	2.92	2.84	2.76	2.67	2.58	2.49
9	3.37	3.23	3.09	2.94	2.86	2.78	2.69	2.61	2.52	2.42
10	3.31	3.17	3.03	2.88	2.80	2.72	2.64	2.55	2.46	2.36
11	3.26	3.12	2.98	2.83	2.75	2.67	2.58	2.50	2.40	2.31
12	3.21	3.07	2.93	2.78	2.70	2.62	2.54	2.45	2.35	2.26
13	3.17	3.03	2.89	2.74	2.66	2.58	2.49	2.40	2.31	2.21
14	3.13	2.99	2.85	2.70	2.62	2.54	2.45	2.36	2.27	2.17
15	3.09	2.96	2.81	2.66	2.58	2.50	2.42	2.33	2.23	2.13
16	3.06	2.93	2.78	2.63	2.55	2.47	2.38	2.29	2.20	2.10
17	3.03	2.90	2.75	2.60	2.52	2.44	2.35	2.26	2.17	2.06
18	3.00	2.87	2.73	2.57	2.49	2.41	2.33	2.23	2.14	2.03
19	2.98	2.84	2.70	2.55	2.47	2.39	2.30	2.21	2.11	2.01
20	2.80	2.66	2.52	2.37	2.29	2.20	2.11	2.02	1.92	1.80
21	2.63	2.50	2.35	2.20	2.12	2.03	1.94	1.84	1.73	1.60
22	2.47	2.34	2.19	2.03	1.95	1.86	1.76	1.66	1.53	1.38
23	2.32	2.18	2.04	1.88	1.79	1.70	1.59	1.47	1.32	1.00

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