Do not write your answers here.
Please leave the space and summarize your answer in the beginning of your answer sheet according to the format shown as follows.

1	(1)	(2)
2	(1)	(2)
3	(1)	(2)
	(3)	(4)
4	(1)	(2)
	(3)	(4)
5	(1)	(2)
	(3)	(4)
6	(1)	(2)
	(3)	(4)

1. (10%) An inspector working for a manufacturing company has a 98% chance of correctly identify defective items and have 1% chance of incorrectly classifying a good item as defective. The company has evidence that its line produces 3% of nonconformance items.
   (1) (5%)What is the probability that an item selected for inspections is classified as defective?
   (2) (5%)If an item selected at random is classified as no defective what is the probability that is indeed good?

2. (10%) Defects occur randomly over the surface of a semiconductor chip. However, only 80% of defects can be found by testing. A sample of 30 chips with one defect each is tested. Let X denote the number of chips in which the test finds a defect. Use a proper probability model to calculate the following probabilities
   (1) (5%) $P(1 \le X \le 29)$
   (2) (5%) $P(\mu - 2\sigma \le X \le \mu + 2\sigma)$

3. (20%) To better understand whether and how the Total Quality Management (TQM) is practiced in Taiwan, National Cheng Kung University researchers interviewed one manager in each of a sample of 100 companies in Southern Taiwan Science Park.

	Service Firms	Manufacturing Firms
Number practicing TQM	46	24
Number not practicing TQM	14	16

   The researchers want to know if there is evidence to show the proportions of companies in practicing TQM are different in the two kinds of firms.
   Write out
   (1) (5%)the null and alternative hypothesis.
   (2) (5%)test statistics.
   (3) (5%)decision and conclusion at alpha = 0.05.
   (4) (5%)decision and conclusion at alpha = 0.1.

(背面仍有題目,請繼續作答)

4. (20%) The environmental Protection Agency (EPA) estimated that the 2011 Honda Civic automobile obtains a mean of 35 miles per gallon (mpg) on the highway. However the company that manufactures the car claims that the EPA has underestimated the Civic's mileage. To support its assertion, the company selects 25 model 2011 Civic cars and records the mileage. The following data resulted: $\bar{x}$ =37 mpg, s=5 mpg.
   (1). (5%)Write out the null and alternative hypothesis.
   (2). (5%)Write out test statistics. Give the test using alpha=0.05.
   (3). (5%)Calculate the p-value of the test. Find the smallest alpha value that we can reject the null hypothesis in (1).
   (4). (5%)Calculate the power of the test for the mean values of 37, assuming s=5 is a good estimate of population standard deviation.

5. (20%)The amount of catalyst (x_i) and the yield (y_i) of a chemical experiment are analyzed using simple linear regression model:
   y_i=alpha0+alpha1*x_i+e_i, i=1,2,…,27.
   where y_i is the response variable, x_i is the independent variable and e_i is the random error term.
   Suppose corrected sum of squares of x (S_{xx})=7, error sum of squares (SSE)=25 and regression sum of squares (SSR)=21.
   (1) (5%)Write down the formula for SSE and SSR.
   (2) (5%)Give the least square estimate of alpha1.
   (3) (5%)Give the F test statistic to test the significance of alpha1 at the level of 0.1.
   (4) (5%)Give the coefficient of determination. Is the simple linear regression model good?

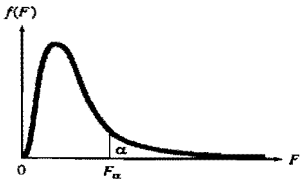
6. (20%) One important quality index of the clamp is the gap between two ends of the fastener. Their preferred target width is 54/1000 inches. An optical measuring device was to measure the gap during the process. The manufacturer sampled five finished clamps every 15 minutes throughout its 16 hours daily production schedule and optically measured the gap in 1/1000 inches.

Time	1	2	3	4	5	Mean	Range
0:15	54.2	54.1	53.9	54.0	53.8	54.00	0.4
0:30	53.9	53.7	54.1	54.4	55.1	54.24	1.4
0:45	54.0	55.2	53.1	55.9	54.5	54.54	2.8
1:00	52.1	53.4	52.9	53.0	52.7	52.82	1.3
1:15	53.0	51.9	52.6	53.4	51.7	52.52	1.7
1:30	54.2	55.0	54.0	53.8	53.6	54.12	1.4
1:45	55.2	56.6	53.1	52.9	54.0	54.36	3.7
2:00	53.3	57.2	54.5	51.6	54.3	54.18	5.6
2:15	54.9	56.3	55.2	56.1	54.0	55.30	2.3
2:30	55.7	53.1	52.9	56.3	55.4	54.68	3.4
2:45	55.2	51.0	56.3	55.6	54.2	54.46	5.3
3:00	54.2	54.2	55.8	53.8	52.1	54.02	3.7
3:15	55.7	57.5	55.4	54.0	53.1	55.14	4.4
3:30	53.7	56.9	54.0	55.1	54.2	54.78	3.2
3:45	54.1	53.9	54.0	54.6	54.8	54.28	0.9
4:00	53.5	56.1	55.1	55.0	54.0	54.74	2.6

The total mean: m = 54.26, the range mean: r = 2.76.
The manufacturer decided to use the formula ($m-A_2*r$, $m+A_2*r$) and ($r*D_3$, $r*D_4$) as the control limits (CL) of X-bar control chart and R control chart.

(1). (5%)Find the UCL and LCL for the X-bar control chart and R control chart.
(2). (5%)Is the normal assumption of the measurements needed for the control charts?
(3). (5%)Are the process in control? Why?
(4). (5%)Can the control limits be used as the limits for the future observations? Why?

TABLE VIII Percentage Points of the *F*-distribution, $\alpha = .10$



DENOMINATOR DEGREES OF FREEDOM (ν_2) \ NUMERATOR DEGREES OF FREEDOM (ν_1)	1	2	3	4	5	6	7	8	9
1	39.86	49.50	53.59	55.83	57.24	58.20	58.91	59.44	59.86
2	8.53	9.00	9.16	9.24	9.29	9.33	9.35	9.37	9.38
3	5.54	5.46	5.39	5.34	5.31	5.28	5.27	5.25	5.24
4	4.54	4.32	4.19	4.11	4.05	4.01	3.98	3.95	3.94
5	4.06	3.78	3.62	3.52	3.45	3.40	3.37	3.34	3.32
6	3.78	3.46	3.29	3.18	3.11	3.05	3.01	2.98	2.96
7	3.59	3.26	3.07	2.96	2.88	2.83	2.78	2.75	2.72
8	3.46	3.11	2.92	2.81	2.73	2.67	2.62	2.59	2.56
9	3.36	3.01	2.81	2.69	2.61	2.55	2.51	2.47	2.44
10	3.29	2.92	2.73	2.61	2.52	2.46	2.41	2.38	2.35
11	3.23	2.86	2.66	2.54	2.45	2.39	2.34	2.30	2.27
12	3.18	2.81	2.61	2.48	2.39	2.33	2.28	2.24	2.21
13	3.14	2.76	2.56	2.43	2.35	2.28	2.23	2.20	2.16
14	3.10	2.73	2.52	2.39	2.31	2.24	2.19	2.15	2.12
15	3.07	2.70	2.49	2.36	2.27	2.21	2.16	2.12	2.09
16	3.05	2.67	2.46	2.33	2.24	2.18	2.13	2.09	2.06
17	3.03	2.64	2.44	2.31	2.22	2.15	2.10	2.06	2.03
18	3.01	2.62	2.42	2.29	2.20	2.13	2.08	2.04	2.00
19	2.99	2.61	2.40	2.27	2.18	2.11	2.06	2.02	1.98
20	2.97	2.59	2.38	2.25	2.16	2.09	2.04	2.00	1.96
21	2.96	2.57	2.36	2.23	2.14	2.08	2.02	1.98	1.95
22	2.95	2.56	2.35	2.22	2.13	2.06	2.01	1.97	1.93
23	2.94	2.55	2.34	2.21	2.11	2.05	1.99	1.95	1.92
24	2.93	2.54	2.33	2.19	2.10	2.04	1.98	1.94	1.91
25	2.92	2.53	2.32	2.18	2.09	2.02	1.97	1.93	1.89
26	2.91	2.52	2.31	2.17	2.08	2.01	1.96	1.92	1.88
27	2.90	2.51	2.30	2.17	2.07	2.00	1.95	1.91	1.87
28	2.89	2.50	2.29	2.16	2.06	2.00	1.94	1.90	1.87
29	2.89	2.50	2.28	2.15	2.06	1.99	1.93	1.89	1.86
30	2.88	2.49	2.28	2.14	2.05	1.98	1.93	1.88	1.85
40	2.84	2.44	2.23	2.09	2.00	1.93	1.87	1.83	1.79
60	2.79	2.39	2.18	2.04	1.95	1.87	1.82	1.77	1.74
120	2.75	2.35	2.13	1.99	1.90	1.82	1.77	1.72	1.68
∞	2.71	2.30	2.08	1.94	1.85	1.77	1.72	1.67	1.63

Source: From M. Merrington and C. M. Thompson, "Tables of Percentage Points of the Inverted Beta (*F*)-Distribution," *Biometrika*, 1943, 33, 73–88. Reproduced by permission of the *Biometrika* Trustees.

(continued)

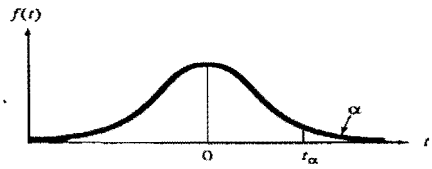
TABLE XII Control Chart Constants

Number of Observations In Subgroup, n	A_2	d_2	d_3	D_3	D_4
2	1.880	1.128	.853	.000	3.267
3	1.023	1.693	.888	.000	2.574
4	.729	2.059	.880	.000	2.282
5	.577	2.326	.864	.000	2.114
6	.483	2.534	.848	.000	2.004
7	.419	2.704	.833	.076	1.924
8	.373	2.847	.820	.136	1.864
9	.337	2.970	.808	.184	1.816
10	.308	3.078	.797	.223	1.777
11	.285	3.173	.787	.256	1.744
12	.266	3.258	.778	.283	1.717
13	.249	3.336	.770	.307	1.693
14	.235	3.407	.762	.328	1.672
15	.223	3.472	.755	.347	1.653
16	.212	3.532	.749	.363	1.637
17	.203	3.588	.743	.378	1.622
18	.194	3.640	.738	.391	1.608
19	.187	3.689	.733	.403	1.597
20	.180	3.735	.729	.415	1.585
21	.173	3.778	.724	.425	1.575
22	.167	3.819	.720	.434	1.566
23	.162	3.858	.716	.443	1.557
24	.157	3.895	.712	.451	1.548
25	.153	3.931	.709	.459	1.541

Source: ASTM Manual on the Presentation of Data and Control Chart Analysis, Philadelphia, PA: American Society for Testing Materials, pp. 134–136, 1976.

(背面仍有題目,請繼續作答)

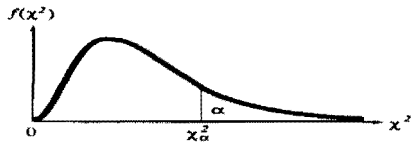
TABLE VI Critical Values of t



ν	$t_{.100}$	$t_{.050}$	$t_{.025}$	$t_{.010}$	$t_{.005}$	$t_{.001}$	$t_{.0005}$
1	3.078	6.314	12.706	31.821	63.657	318.31	636.62
2	1.886	2.920	4.303	6.965	9.925	22.326	31.598
3	1.638	2.353	3.182	4.541	5.841	10.213	12.924
4	1.533	2.132	2.776	3.747	4.604	7.173	8.610
5	1.476	2.015	2.571	3.365	4.032	5.893	6.869
6	1.440	1.943	2.447	3.143	3.707	5.208	5.959
7	1.415	1.895	2.365	2.998	3.499	4.785	5.408
8	1.397	1.860	2.306	2.896	3.355	4.501	5.041
9	1.383	1.833	2.262	2.821	3.250	4.297	4.781
10	1.372	1.812	2.228	2.764	3.169	4.144	4.587
11	1.363	1.796	2.201	2.718	3.106	4.025	4.437
12	1.356	1.782	2.179	2.681	3.055	3.930	4.318
13	1.350	1.771	2.160	2.650	3.012	3.852	4.221
14	1.345	1.761	2.145	2.624	2.977	3.787	4.140
15	1.341	1.753	2.131	2.602	2.947	3.733	4.073
16	1.337	1.746	2.120	2.583	2.921	3.686	4.015
17	1.333	1.740	2.110	2.567	2.898	3.646	3.965
18	1.330	1.734	2.101	2.552	2.878	3.610	3.922
19	1.328	1.729	2.093	2.539	2.861	3.579	3.883
20	1.325	1.725	2.086	2.528	2.845	3.552	3.850
21	1.323	1.721	2.080	2.518	2.831	3.527	3.819
22	1.321	1.717	2.074	2.508	2.819	3.505	3.792
23	1.319	1.714	2.069	2.500	2.807	3.485	3.767
24	1.318	1.711	2.064	2.492	2.797	3.467	3.745
25	1.316	1.708	2.060	2.485	2.787	3.450	3.725
26	1.315	1.706	2.056	2.479	2.779	3.435	3.707
27	1.314	1.703	2.052	2.473	2.771	3.421	3.690
28	1.313	1.701	2.048	2.467	2.763	3.408	3.674
29	1.311	1.699	2.045	2.462	2.756	3.396	3.659
30	1.310	1.697	2.042	2.457	2.750	3.385	3.646
40	1.303	1.684	2.021	2.423	2.704	3.307	3.551
60	1.296	1.671	2.000	2.390	2.660	3.232	3.460
120	1.289	1.658	1.980	2.358	2.617	3.160	3.373
∞	1.282	1.645	1.960	2.326	2.576	3.090	3.291

Source: This table is reproduced with the kind permission of the Trustees of Biometrika from E. S. Pearson and H. O. Hartley (eds.), *The Biometrika Tables for Statisticians*, Vol. 1, 3d ed., Biometrika, 1966.

TABLE VII Critical Values of χ^2



Degrees of Freedom	$\chi^2_{.995}$	$\chi^2_{.990}$	$\chi^2_{.975}$	$\chi^2_{.950}$	$\chi^2_{.900}$
1	.0000393	.0001571	.0009821	.0039321	.0157908
2	.0100251	.0201007	.0506356	.102587	.210720
3	.0717212	.114832	.215795	.351846	.584375
4	.206990	.297110	.484419	.710721	1.063623
5	.411740	.554300	.831211	1.145476	1.61031
6	.675727	.872085	1.237347	1.63539	2.20413
7	.989265	1.239043	1.68987	2.16735	2.83311
8	1.344419	1.646482	2.17973	2.73264	3.48954
9	1.734926	2.087912	2.70039	3.32511	4.16816
10	2.15585	2.55821	3.24697	3.94030	4.86518
11	2.60321	3.05347	3.81575	4.57481	5.57779
12	3.07382	3.57056	4.40379	5.22603	6.30380
13	3.56503	4.10691	5.00874	5.89186	7.04150
14	4.07468	4.66043	5.62872	6.57063	7.78953
15	4.60094	5.22935	6.26214	7.26094	8.54675
16	5.14224	5.81221	6.90766	7.96164	9.31223
17	5.69724	6.40776	7.56418	8.67176	10.0852
18	6.26481	7.01491	8.23075	9.39046	10.8649
19	6.84398	7.63273	8.90655	10.1170	11.6509
20	7.43386	8.26040	9.59083	10.8508	12.4426
21	8.03366	8.89720	10.28293	11.5913	13.2396
22	8.64272	9.54249	10.9823	12.3380	14.0415
23	9.26042	10.19567	11.6885	13.0905	14.8479
24	9.88623	10.8564	12.4011	13.8484	15.6587
25	10.5197	11.5240	13.1197	14.6114	16.4734
26	11.1603	12.1981	13.8439	15.3791	17.2919
27	11.8076	12.8786	14.5733	16.1513	18.1138
28	12.4613	13.5648	15.3079	16.9279	18.9392
29	13.1211	14.2565	16.0471	17.7083	19.7677
30	13.7867	14.9535	16.7908	18.4926	20.5992
40	20.7065	22.1643	24.4331	26.5093	29.0505
50	27.9907	29.7067	32.3574	34.7642	37.6886
60	35.5346	37.4848	40.4817	43.1879	46.4589
70	43.2752	45.4418	48.7576	51.7393	55.3290
80	51.1720	53.5400	57.1532	60.3915	64.2778
90	59.1963	61.7541	65.6466	69.1260	73.2912
100	67.3276	70.0648	74.2219	77.9295	82.3581

Source: From C. M. Thompson, "Tables of the Percentage Points of the χ^2-Distribution," *Biometrika*, 1941, 32, 188–189. Reproduced by permission of the *Biometrika* Trustees.

(continued)