KERTAS SOALAN TERTUTUP

Index No: ____________

UNIVERSITI SAINS MALAYSIA

Peperiksaan Kursus Semasa Cuti Panjang
Academic Session 2008/2009

Jun 2009

JKE 316E – Quantitative Economics
[Ekonomi Kuantitatif]

Duration : 3 hours
[Masa : 3 jam]

INSTRUCTIONS TO CANDIDATES

- This examination paper consists of **NINETEEN** pages, Appendix A (formula) and Appendix B (Table Z, t and F).
- Answer **ALL** questions. You may answer **either** in Bahasa Malaysia or in English.
- Write your answer in the space provided only.

ARAHAN

*Sila pastikan bahawa kertas peperiksaan ini mengandungi **SEMBILAN BELAS** muka surat yang bercetak, Lampiran A (Formula) dan Lampiran B (Jadual Z, t dan F), sebelum anda memulakan peperiksaan.*

*Jawab **SEMUA** soalan. Anda dibenarkan menjawab soalan **sama ada** dalam Bahasa Malaysia atau Bahasa Inggeris.*

Tulis jawapan anda di ruangan yang disediakan.

Angka Giliran: ______________________________

Pusat Peperiksaan: ___________________________

Tarikh Peperiksaan: __________________________

...2/-

1. Write short notes on:
(Tulis nota ringkas tentang:)

(a) Type I error (3 marks)
(Ralat jenis I) *(3 markah)*

(b) Type II error (3 marks)
(Ralat jenis II) *(3 markah)*

(c) Interval data (3 marks)
(Data interval) *(3 markah)*

(d) Measures of central location (8 marks)
(Pengukuran lokasi memusat) *(8 markah)*

(e) Cluster sampling (8 marks)
(Persampelan kluster) *(8 markah)*

...4/-

2. You are given with the following information.
(*Anda diberi maklumat berikut)*

Ho: $\mu = 1{,}000$

Ha: $\mu \neq 1{,}000$

$\bar{x} = 980$, $n = 100$, and $\sigma = 200$. $\alpha = .01$

(a) Find the value of test statistic (3 marks)
(Cari nilai ujian statistik) *(3 markah)*

(b) Interpret the result (3 marks)
(Beri tafsiran keputusan yang anda perolehi di atas) *(3 markah)*

(c) Draw the sampling distribution (3 marks)
(Lukis taburan persampelan) *(3 markah)*

...5/-

(d) Explain the importance of hypothesis testing (3 marks)
(Jelaskan kepentingan ujian hipotesis) *(3 markah)*

(e) Describe the process of conducting a hypotheses testing (8 marks)
(Jelaskan proses menjalankan ujian hipotesis) *(8 markah)*

(f) A traffic police officer claimed that the average speed of cars exceeds the limit of 110 kilometer per hour. The speeds of a random sample of 100 cars were recorded at 115 kph. Assume the standard deviation is 8 kph, determine whether the claim by the officer can be substantiated. Use 5% significant level.

(10 marks)

(Seorang pegawai polis mendakwa bahawa purata kelajuan kereta adalah melebihi 110 km sejam. Kelajuan satu sampel rawak 100 kereta ialah 115 km sejam. Andaikan sisihan piawai ialah 8 kilometer sejam, tentukan sama ada dakwaan pegawai itu dapat diterima. Guna 5% paras keertian.)

(10 markah)

...7/-

...8/-

3. (a) Complete the following ANOVA table by writing the correct figures in the shaded cells only.

(12 marks)

(Lengkapkan jadual ANOVA di bawah dengan menulis angka yang betul di petak yang dikelabukan)

(12 markah)

Source	df	Sum of Squares	Mean Squares	F
Treatments			50	
Blocks	5	50		
Error	12			
Total	20	175		

(b) The sample size (n) for the study was ___________. (2 marks)

(Saiz sampel (n) kajian ialah ________.) *(2 markah)*

(c) Test to determine whether the treatment means differ. (Use $\alpha = .05$)

(3 marks)

(Uji sama ada min ujikaji berbeza. Guna $\alpha = .05$)

(3 markah)

(d) Test to determine whether the block means differ. (Use $\alpha = .05$)

(3 marks)

(Uji sama ada min blok adalah berbeza. Guna $\alpha = .05$)

(3 markah)

4. The relationship between years of experience and amount of sales closed by six randomly selected salesmen is shown in the following table. n = 6.

(Hubungan antara pengalaman dan jumlah jualan yang dibuat oleh enam jurujual yang dipilih secara rawak adalah seperti di dalam jadual. n = 6)

Experience , X (years)	1	2	3	4	5	6
Sales, Y (RM'000)	6	1	9	5	17	12

(a) Plot a scatter diagram for the above data. (2 marks)
(Buat rajah sebaran untuk data di atas) *(2 markah)*

(b) Calculate the least squares line and interpret the coefficients. Use the following information in your calculation:

(8 marks)

(Dapatkan garis kuasa dua terkecil dan beri tafsiran koefisien. Guna maklumat berikut dalam pengiraan anda)

(8 markah)

$\Sigma xy = 37.76 \qquad \Sigma x^2 = 42.79$

$S_{xy} = 7.4 \qquad S^2_x = 3.5$

(c) (i) List and explain the time series components (8 marks)
(Senarai dan jelaskan komponen siri masa) *(8 markah)*

(ii) Describe the smoothing techniques used to reduce random variation in time series data.

(7 marks)

(Huraikan kaedah smoothing yang digunakan untuk mengurangkan variasi rawak dalam data siri masa.)

(7 markah)

APPENDIX A

FORMULAS

Test statistic for μ.

Test statistic $Z = \dfrac{\overline{X}-\mu}{\sigma/\sqrt{n}}$

Test statistic $t = \dfrac{\overline{X}-\mu}{S/\sqrt{n}}$

Sample slope

$$b_1 = \frac{s_{xy}}{s_x^2}$$

Sample y-intercept

$$b_0 = \bar{y} - b_1\bar{x}$$

Sum of squares for error

$$\text{SSE} = \sum_{i=1}^{n}(y_i - \hat{y}_i)^2$$

Standard error of estimate

$$s_\varepsilon = \sqrt{\frac{\text{SSE}}{n-2}}$$

Test statistic for the slope

$$t = \frac{b_1 - \beta_1}{s_{b_1}}$$

Standard error of b_1

$$s_{b_1} = \frac{s_\varepsilon}{\sqrt{(n-1)s_x^2}}$$

Coefficient of determination

$$R^2 = \frac{s_{xy}^2}{s_x^2 s_y^2} = 1 - \frac{SSE}{\sum(y_i - \bar{y})^2}$$

Prediction interval

$$\hat{y} \pm t_{\alpha/2,n-2}s_\varepsilon\sqrt{1 + \frac{1}{n} + \frac{(x_g - \bar{x})^2}{(n-1)s_x^2}}$$

Confidence interval estimator of the expected value of y

$$\hat{y} \pm t_{\alpha/2,n-2}s_\varepsilon\sqrt{\frac{1}{n} + \frac{(x_g - \bar{x})^2}{(n-1)s_x^2}}$$

Sample coefficient of correlation

$$r = \frac{s_{xy}}{s_x s_y}$$

Test statistic for testing $\rho = 0$

$$t = r\sqrt{\frac{n-2}{1-r^2}}$$

Least Squares Line Coefficients

$$b_1 = \frac{s_{xy}}{s_x^2}$$

$$b_0 = \bar{y} - b_1\bar{x}$$

where

$$s_{xy} = \frac{\sum_{i=1}^{n}(x_i - \bar{x})(y_i - \bar{y})}{n-1}$$

$$s_x^2 = \frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n-1}$$

$$\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n}$$

$$\bar{y} = \frac{\sum_{i=1}^{n} y_i}{n}$$

FORMULAS

One-way analysis of variance

$$SST = \sum_{j=1}^{k} n_j(\bar{x}_j - \bar{\bar{x}})^2$$

$$SSE = \sum_{j=1}^{k} \sum_{i=1}^{n_j} (x_{ij} - \bar{x}_j)^2$$

$$MST = \frac{SST}{k-1}$$

$$MSE = \frac{SSE}{n-k}$$

$$F = \frac{MST}{MSE}$$

Two-way analysis of variance (randomized block design of experiment)

$$SS(Total) = \sum_{j=1}^{k} \sum_{i=1}^{b} (x_{ij} - \bar{\bar{x}})^2$$

$$SST = \sum_{i=1}^{k} b(\bar{x}[T]_j - \bar{\bar{x}})^2$$

$$SSB = \sum_{i=1}^{b} k(\bar{x}[B]_i - \bar{\bar{x}})^2$$

$$SSE = \sum_{j=1}^{k} \sum_{i=1}^{b} (x_{ij} - \bar{x}[T]_j - \bar{x}[B]_i + \bar{\bar{x}})^2$$

$$MST = \frac{SST}{k-1}$$

$$MSB = \frac{SSB}{b-1}$$

$$MSE = \frac{SSE}{n-k-b+1}$$

$$F = \frac{MST}{MSE}$$

$$F = \frac{MSB}{MSE}$$

Two-factor experiment

$$SS(Total) = \sum_{i=1}^{a} \sum_{j=1}^{b} \sum_{k=1}^{r} (x_{ijk} - \bar{\bar{x}})^2$$

$$SS(A) = rb \sum_{i=1}^{a} (\bar{x}[A]_i - \bar{\bar{x}})^2$$

$$SS(B) = ra \sum_{j=1}^{b} (\bar{x}[B]_j - \bar{\bar{x}})^2$$

$$SS(AB) = r \sum_{i=1}^{a} \sum_{j=1}^{b} (\bar{x}[AB]_{ij} - \bar{x}[A]_i - \bar{x}[B]_j + \bar{\bar{x}})^2$$

$$SSE = \sum_{i=1}^{a} \sum_{j=1}^{b} \sum_{k=1}^{r} (x_{ijk} - \bar{x}[AB]_{ij})^2$$

$$MS(A) = \frac{SS(A)}{a-1}$$

$$MS(B) = \frac{SS(B)}{b-1}$$

$$MS(AB) = \frac{SS(AB)}{(a-1)(b-1)}$$

$$F = \frac{MS(A)}{MSE}$$

$$F = \frac{MS(B)}{MSE}$$

$$F = \frac{MS(AB)}{MSE}$$

Least significant difference comparison method

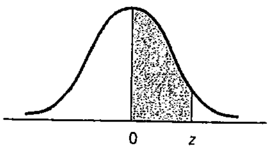
$$LSD = t_{\alpha/2}\sqrt{MSE\left(\frac{1}{n_i} + \frac{1}{n_j}\right)}$$

Tukey's multiple comparison method

$$\omega = q_\alpha(k, \nu)\sqrt{\frac{MSE}{n_g}}$$

APPENDIX B

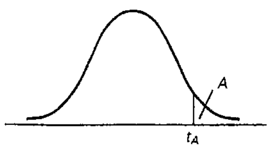
Table 3 Normal Probabilities



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	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990

SOURCE: Abridged from Table 1 of A. Hald, *Statistical Tables and Formulas* (New York: Wiley & Sons, Inc.), 1952. Reproduced by permission of A. Hald and the publisher, John Wiley & Sons, Inc.

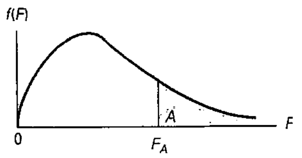
Table 4 Critical Values of t



DEGREES OF FREEDOM	$t_{.100}$	$t_{.050}$	$t_{.025}$	$t_{.010}$	$t_{.005}$	DEGREES OF FREEDOM	$t_{.100}$	$t_{.050}$	$t_{.025}$	$t_{.010}$	$t_{.005}$
1	3.078	6.314	12.706	31.821	63.657	24	1.318	1.711	2.064	2.492	2.797
2	1.886	2.920	4.303	6.965	9.925	25	1.316	1.708	2.060	2.485	2.787
3	1.638	2.353	3.182	4.541	5.841	26	1.315	1.706	2.056	2.479	2.779
4	1.533	2.132	2.776	3.747	4.604	27	1.314	1.703	2.052	2.473	2.771
5	1.476	2.015	2.571	3.365	4.032	28	1.313	1.701	2.048	2.467	2.763
6	1.440	1.943	2.447	3.143	3.707	29	1.311	1.699	2.045	2.462	2.756
7	1.415	1.895	2.365	2.998	3.499	30	1.310	1.697	2.042	2.457	2.750
8	1.397	1.860	2.306	2.896	3.355	35	1.306	1.690	2.030	2.438	2.724
9	1.383	1.833	2.262	2.821	3.250	40	1.303	1.684	2.021	2.423	2.705
10	1.372	1.812	2.228	2.764	3.169	45	1.301	1.679	2.014	2.412	2.690
11	1.363	1.796	2.201	2.718	3.106	50	1.299	1.676	2.009	2.403	2.678
12	1.356	1.782	2.179	2.681	3.055	60	1.296	1.671	2.000	2.390	2.660
13	1.350	1.771	2.160	2.650	3.012	70	1.294	1.667	1.994	2.381	2.648
14	1.345	1.761	2.145	2.624	2.977	80	1.292	1.664	1.990	2.374	2.639
15	1.341	1.753	2.131	2.602	2.947	90	1.291	1.662	1.987	2.369	2.632
16	1.337	1.746	2.120	2.583	2.921	100	1.290	1.660	1.984	2.364	2.626
17	1.333	1.740	2.110	2.567	2.898	120	1.289	1.658	1.980	2.358	2.617
18	1.330	1.734	2.101	2.552	2.878	140	1.288	1.656	1.977	2.353	2.611
19	1.328	1.729	2.093	2.539	2.861	160	1.287	1.654	1.975	2.350	2.607
20	1.325	1.725	2.086	2.528	2.845	180	1.286	1.653	1.973	2.347	2.603
21	1.323	1.721	2.080	2.518	2.831	200	1.286	1.653	1.972	2.345	2.601
22	1.321	1.717	2.074	2.508	2.819	∞	1.282	1.645	1.960	2.326	2.576
23	1.319	1.714	2.069	2.500	2.807						

SOURCE: From M. Merrington, "Table of Percentage Points of the t-Distribution," *Biometrika* 32 (1941): 300. Reproduced by permission of the Biometrika Trustees.

Table 6(a) Critical Values of F: $A = .05$



DENOMINATOR DEGREES OF FREEDOM (ν_2)

ν_2 \ ν_1	NUMERATOR DEGREES OF FREEDOM								
	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
∞	3.84	3.00	2.60	2.37	2.21	2.10	2.01	1.94	1.88

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

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