UNIVERSITI SAINS MALAYSIA

Second Semester Examination
Academic Session 2003/2004

February/March 2004

RPG 131E – Applied Quantitative Methods
(Kaedah Kuantitatif Gunaan)

Duration: 3 hours
(Masa: 3 jam)

Please check that this examination paper consists of **TEN** pages of printed material before you begin the examination.

*(Sila pastikan bahawa kertas peperiksaan ini mengandungi **SEPULUH** muka surat yang tercetak sebelum anda memulakan peperiksaan ini.)*

Instructions: Answer **ALL** questions.
*(**Arahan:** Jawab SEMUA soalan).*

1. **Table 1** shows a frequency distribution of annual sales commission received by car salespersons in Penang. The data was obtained from a survey of 250 car salespersons in Penang.

Jadual 1 menunjukkan taburan frekuensi bagi komisen jualan tahunan yang diterima oleh penjual kereta di Pulau Pinang. Data telah diperolehi daripada kajian 250 orang penjual kereta di Pulau Pinang.

(a) Based on **Table 1**, what is the probability that a car salesperson makes a commission of:

(i) between RM8,000 and RM12,000
(ii) less than RM8,000
(iii) more than RM24,000
(iv) between RM12,000 and RM16,000

Berdasarkan Jadual 1, apakah kebarangkalian seorang penjual kereta mendapat komisen:

(i) antara RM8,000 dan RM12,000
(ii) kurang daripada RM8,000
(iii) lebih daripada RM24,000
(iv) antara RM12,000 dan RM16,000

(4 marks/*markah*)

(b) Based on **Table 1**, construct a probability distribution table.

Berdasarkan Jadual 1, bina sebuah jadual taburan kebarangkalian.

(5 marks/*markah*)

Table 1 : Annual Sales Commission
Jadual 1: Komisen Jualan Tahunan

Annual Commissions (RM) *Komisen Tahunan (RM)*	**Frequency** *Frekuensi*
0 – 3,999	10
4,000 – 7,999	25
8,000 – 11,999	55
12,000 – 15,999	95
16,000 – 19,999	30
20,000 – 23,999	20
24,000 +	15

(c) Describe the four types of variation in time series analysis.

Terangkan empat variasi dalam analisis siri masa.

(8 marks/*markah*)

(d) A university's admission office has compiled the annual enrollment figures (in thousands) for the previous 20 years (1984-2003) as shown in **Table 2**.

(i) Calculate a five-year centered moving average from **Table 2**.

(ii) Plot the original data and the five-year centered moving averages on one chart.

Pejabat Bahagian Kemasukan Universiti telah mengumpulkan maklumat pendaftaran pelajar mengikut tahun (dalam ribu) sejak 20 tahun yang lepas (1984-2003) seperti yang ditunjukkan dalam Jadual 2.

(i) Kira lima-tahun 'centered moving averages' daripada Jadual 2.

(ii) Plot data asal dan lima-tahun 'centered moving averages' dalam satu carta.

(8 marks/*markah*)

Table 2 : University Annual Enrollment (in thousands)
Jadual 2: Pendaftaran Universiti Mengikut Tahun (dalam ribu)

Year *Tahun*	**Number of Students** *Bilangan Pelajar*	**Year** *Tahun*	**Number of Students** *Bilangan Pelajar*
1984	199	1994	242
1985	168	1995	340
1986	291	1996	210
1987	236	1997	193
1988	248	1998	263
1989	211	1999	312
1990	209	2000	259
1991	240	2001	236
1992	281	2002	295
1993	233	2003	349

2. (a) Filem Negara Malaysia knows that the popular movie "Godzilla II" ran an average of 76 days in each Malaysian city, with a standard deviation of 8 days. A film producer from Penang was interested in comparing the movie's popularity in Penang with that of all other Malaysian cinemas. He randomly chooses 100 cinemas in Penang and finds that they ran the movie an average of 72 days. The manager wants to know if there is a significant difference between the mean number of days in Penang and all other Malaysian cinemas. Assume a normal distribution.

Filem Negara Malaysia mengetahui sebuah filem popular "Godzilla II" ditayangkan selama 76 hari secara purata di setiap bandar di Malaysia, dengan sisihan piawai 8 hari. Seorang penerbit filem dari Pulau Pinang berminat untuk meninjau populariti filem tersebut di Pulau Pinang berbanding dengan pawagam lain di seluruh Malaysia. Dia telah memilih 100 buah pawagam di Pulau Pinang secara rambang dan mendapati mereka menayangkan filem itu selama 72 hari secara purata. Penerbit tersebut ingin mengetahui sama ada terdapat perbezaan yang signifikan di antara min bilangan hari di Pulau Pinang dengan pawagam lain di Malaysia. Andaikan taburan normal.

(i) Based on the scenario, state the null and alternative hypotheses.

Berdasarkan senario ini, nyatakan hipotesis null dan hipotesis alternatif.

(2 marks/*markah*)

(ii) Test your hypothesis at a significance level of 0.05. Is the difference in mean significant? Show all workings clearly.

Uji hipothesis anda pada tahap keertian 0.05. Adakah perbezaan min itu signifikan? Tunjuk semua jalankerja dengan jelas.

(6 marks/*markah*)

(b) A housing developer is considering several options that are currently available to his company: either (i) develop the entire site; (ii) develop a small portion of the site and not expand it; (iii) develop a medium-size portion of the site and not expand it; or (iv) do not develop site until 5 years later. A current housing market study has shown a 40% probability in strong market for housing, 25% probability in a fair market and a 35% probability for a poor market. **Table 3** shows the payoffs (in RM thousands) associated with the different options.

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Seorang pemaju perumahan sedang menimbangkan beberapa cadangan semasa untuk syarikat beliau; sama ada (i) memajukan keseluruhan tapak; (ii) memajukan sebahagian daripada tapak (saiz kecil) dan tiada rancangan tambahan; atau (iii) memajukan sebahagian daripada tapak (saiz sederhana) dan tiada rancangan tambahan; atau (iv) tidak langsung memajukan tapak dalam tempuh 5 tahun. Kajian semasa pasaran perumahan menunjukkan 40% kebarangkalian bagi pasaran yang baik untuk perumahan, 25% kebarangkalian bagi pasaran sederhana dan 35% kebarangkalian bagi pasaran lemah. Jadual 3 menunjukkan ganjaran (dalam RM ribu) yang akan diperolehi daripada setiap pilihan.

(i) Draw a decision tree based on the scenario.

Lukis sebuah ranting keputusan berdasarkan senario ini.

(4 marks/*markah*)

(ii) Calculate the expected value and the most likely value of each decision node.

Kira 'the expected value' dan 'the most likely value' bagi setiap ranting keputusan.

(6 marks/*markah*)

(iii) Which option should the housing developer go for? Explain.

Apakah pilihan yang patut dibuat oleh pemaju perumahan? Berikan alasan.

(1 mark/*markah*)

Table 3: Payoff Table
Jadual 3: Jadual Ganjaran

Development Scale *Skala Pemajuan*	**Profit (RM '000)** *Keuntungan (RM '000)*		
	Strong Market *Pasaran Baik*	**Fair Market** *Pasaran sederhana*	**Poor Market** *Pasaran Lemah*
Big *Besar*	550	110	-310
Moderate *Sederhana*	300	129	-100
Small *Kecil*	200	100	-32
No Development *Tiada Pemajuan*	0	0	0

(c) Based on **Table 3**, assuming the probabilities of the market environment are unknown, which decision would satisfy:

(i) The Maximax Criteria?
(ii) The Maximin Criteria?
(iii) The Minimax Regret Criteria?

Berdasarkan kepada Jadual 3, dengan andaian bahawa kebarangkalian bagi keadaan pasaran adalah tidak diketahui, apakah keputusan yang akan menepati:

(i) Kriteria Maximax?
(ii) Kriteria Maximin?
(iii) Kriteria Minimax Regret?

(6 marks/*markah*)

3. (a) Describe the meaning of the following terms:

- Primary Data
- Population
- Bias
- Sample
- Sampling frame

Berikan maksud istilah istilah berikut:

- *Data Primer*
- *Populasi*
- *Bias*
- *Sampel*
- *Rangka persampelan*

(5 marks/*markah*)

(b) Based on **Table 4**, what are the scale categories of the following variables:

- Gender
- Year of study
- Opinion on sports
- Height of jump
- Hall of Residence

Berdasarkan Jadual 4, apakah kategori skala pembolehubah-pembolehubah berikut:

- *Jantina*
- *Tahun Pengajian*
- *Pendapat mengenai sukan*
- *Ketinggian Lompatan*
- *Desasiswa*

(5 marks/*markah*)

Table 4: Information on students' participation in sports.
Jadual 1: Maklumat pelajar-pelajar yang menyertai sukan tahunan

Name *Nama*	Gender *Jantina*	Year of study *Tahun Pengajian*	Opinion on sports *Minat terhadap sukan*	Height of jump *Ketinggian Lompatan* (m)	Running speed *Kelajuan berlari* (m/s)	Hall of Residence *Desasiswa*
Ali	Lelaki	2	Sangat minat	3	2	Indah
Abu	Lelaki	1	Tidak minat	4	5	Permai
Samy	Lelaki	3	Sangat tidak minat	4	3	Cahaya
Sabu	Lelaki	3	Tiada pendapat	8	7	Harapan
Remy	Lelaki	2	Tidak minat	9	8	Gemilang
Renia	Perempuan	1	Sangat minat	3	2	Bakti
Daisy	Perempuan	2	Tidak minat	4	5	Permai
Debby	Perempuan	3	Sangat tidak minat	4	3	Cahaya
Nary	Perempuan	3	Tiada pendapat	8	7	Fajar

(c) Assuming that running speed is the independent variable:

- Draw a graph showing the relationship between "running speed" and "height of jump"
- Draw the "line of best fit"
- What is the correlation value between "running speed" and "height of jump"?
- Based on the correlation results, can we deduce that "height of jump" is the result of "running speed"?

Dengan andaian bahawa kelajuan berlari adalah pembolehubah tidak bergantung:

- *Lakarkan graf perhubungan antara "kelajuan berlari" dan "ketinggian lompatan".*
- *Lakarkan garisan "line of best fit"*
- *Berapakah nilai korelasi antara "kelajuan berlari" dan "ketinggian lompatan"?*
- *Berdasarkan keputusan korelasi, bolehkah disimpulkan bahawa "ketinggian lompatan" adalah disebabkan oleh "kelajuan berlari"?*

(15 marks/*markah*)

Formula Kaedah Pearson Product Moment (r) = $$\frac{N\Sigma xy - (\Sigma x)(\Sigma y)}{\sqrt{[N\Sigma x^2 - (x)^2][N\Sigma y^2 - (y)^2]}}$$

4. (a) Based on **Table 5**, assume that the variable "height" for a sample of 11 HBP students has a standard deviation of 0.2 while the value for the 8 male students is 0.3.

(i) What is the mode value for all the students?
(ii) What is the mean value for all the students?
(iii) What is the median value for all the student?

Berdasarkan Jadual 5, andaikan bahawa pembolehubah "ketinggian" bagi sample sejumlah 11 pelajar PBP mempunyai ralat piawai 0.2. manakala ralat piawai bagi 8 orang pelajar lelaki ialah 0.3.

(i) Apakah nilai mod keseluruhan pelajar ?
(ii) Apakah nilai min keseluruhan pelajar ?
(iii) Apakah nilai median keseluruhan pelajar?

(9 marks/*markah*)

(b) If the variable has a normal distribution, calculate the height range of the following cases:

(i) 68.26% of male cases
(ii) 95.446% of male cases
(iii) 99.7% of male cases

Jika pembolehubah tersebut mempunyai taburan normal, kirakan julat ketinggian bagi kes-kes berikut :

(i) 68.26% daripada kes pelajar lelaki
(ii) 95.44% daripada kes pelajar lelaki
(iii) 99.7% daripada kes pelajar lelaki

(9 marks/*markah*)

(c) Draw a normal distribution graph indicating the location of the cases above.

Lakarkan graf taburan normal bagi menunjukkan kedudukan kes-kes di atas.

(7 marks/*markah*)

Table 5 : Height of HBP students
Jadual 5: Ketinggian pelajar-pelajar PBP

Name *Nama*	Height *Ketinggian*	Gender *Jantina*
Ali	1.7	Male *(Lelaki)*
Abu	1.5	Male *(Lelaki)*
Ah Kau	1.7	Male *(Lelaki)*
Raju	1.6	Male *(Lelaki)*
Linda	1.5	Male *(Lelaki)*
Nirmala	1.4	Female *(Perempuan)*
Sherly	1.6	Female *(Perempuan)*
Lingam	1.8	Male *(Lelaki)*
Ramesh	1.9	Male *(Lelaki)*
Suresh	1.7	Male *(Lelaki)*
Liam	1.7	Male *(Lelaki)*

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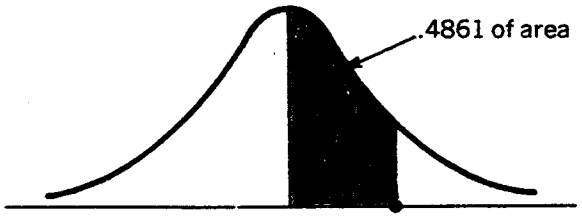
$$Z = \frac{\bar{X} - \mu}{\frac{s}{\sqrt{N}}}$$

Areas under the Standard Normal Probability Distribution between the Mean and Positive Values of z*



EXAMPLE: To find the area under the curve between the mean and a point 2.2 standard deviations to the right of the mean, look up the value opposite 2.2 in the table; .4861 of the area under the curve lies between the mean and a z value of 2.2.

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

* From Robert D. Mason, *Essentials of Statistics*, © 1976, p. 307. Reprinted by permission of Prentice-Hall, Inc., Englewood Cliffs, N.J.