**UNIVERSITI SAINS MALAYSIA**

Final Examination
Academic Session 2007/2008

April 2008

***JMG 317E – Quantitative Geography***
***[Geografi Kuantitatif]***

Duration: 3 hours
*[Masa: 3 jam]*

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Please ensure that this examination paper contains ELEVEN printed pages before you begin the examination.

Answer FOUR questions only. If you answer more than four questions, only the first four will be graded. You can answer either in Bahasa Malaysia or English.

Read the instructions carefully before answering.

Each question is worth 25 marks. Show your works, marks will be given for each work.

*[Sila pastikan bahawa kertas peperiksaan ini mengandungi SEBELAS muka surat yang bercetak sebelum anda memulakan peperiksaan.*

*Jawab EMPAT (4) soalan. Jika calon menjawab lebih daripada empat soalan, hanya empat soalan pertama mengikut susunan dalam skrip jawapan akan diberi markah. Anda boleh menjawab sama ada dalam Bahasa Malaysia atau Bahasa English.*

*Baca arahan dengan teliti sebelum anda menjawab soalan.*

*Setiap soalan diperuntukkan 25 markah.]*

1. Explain the meaning of FIVE (5) of the followings:

   (a) Skewness (5 marks)

   (b) Normal distribution (5 marks)

   (c) Interval data (5 marks)

   (d) Frequency distribution (5 marks)

   (e) Confidence interval (5 marks)

   (f) Significance level (5 marks)

   (g) Hypothesis testing (5 marks)

2. Construct a frequency table and draw a histogram for the following dataset.

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 32 | 35 | 42 | 33 | 36 | 38 | 37 | 33 | 38 | 36 | 35 | 34 | 37 | 40 | 38 | 36 | 35 | 31 | 37 | 36 | 33 |
| 36 | 39 | 40 | 33 | 30 | 35 | 37 | 39 | 32 | 39 | 37 | 35 | 36 | 39 | 33 | 31 | 40 | 37 | 34 | 34 | 37 |

(25 marks)

3. In one class, half of the students are given coffee with caffeine and another half coffee without caffeine. The number of times each student yawns during the lecture is recorded with the following results. Answer the following questions.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| With Caffeine | 3 | 5 | 0 | 12 | 7 | 2 | 5 | 8 |
| Without Caffeine | 8 | 9 | 17 | 10 | 4 | 12 | 16 | 11 |

   (a) What is the problem statement of the above scenario?

   (5 marks)

   (b) State the null and alternative hypothesis.

   (5 marks)

   (c) Test the hypothesis and place a 95% confidence interval on the regression coefficient.

   (15 marks)

4. Find the mean, standard deviation and z-score of the following dataset, show your work.

43, 6, 7, 122, 41, 21, 17, 1, 3

(25 marks)

5. The following data are collected in an effort to determine whether rainfall (inches) is dependent on elevation (feet).

| Rainfall (inches) | Elevation (feet) |
|---|---|
| 36 | 400 |
| 78 | 800 |
| 11 | 200 |
| 45 | 675 |

(a) Based on the above table, test the hypothesis that the regression coefficient associated with the independent variables is equal to zero. Place a 95% confidence interval on the regression coefficient.

(25 marks)

6. (a) What is a quadrat analysis?

(10 marks)

(b) List down step by step procedures of quadrat analysis method.

(15 marks)

## MEASURE OF CENTRAL TENDENCY AND MEASURE OF VARIABILITY

**Formulea**

1. $\bar{X}, = \Sigma \frac{X}{N}$ or $\bar{X} = \Sigma \frac{fx}{N}$ or $\frac{1}{n} \Sigma fm$

2. $\hat{X} = L + \left( \frac{d_1}{d_1 + d_2} \right) c$ or $L + \frac{cd_1}{d_1 + d_2}$

3. $\tilde{X}$ $\frac{N+1}{2}$ or $\hat{X} = L + \left( \frac{n}{2} - F \right) \frac{c}{f}$

4. No. of class = $K = 1 + 3.3 \log n$

5. Class Interval $= \frac{\text{range}}{K} + 1$

6. Range = $J = m_T - m_R$

7. Quartile $Q = ½ (Q_3 - Q_1)$ or $Q_1 = L + \left( \frac{n}{4} - F \right) \frac{c}{f}$ & $Q_3 = L + \left\{ \frac{n}{4}(3) - F \right\} \frac{c}{f}$

8. Mean deviation $= \frac{\left| \sum X_i \right|}{n}$ or $= \frac{1}{n} \sum \left| X_i - \bar{X} \right|$ or $\frac{1}{n} \sum_{i=1}^{k} f_i \left| X_i - \bar{X} \right|$

   or $\frac{1}{n} \sum f_i \left( \left| m_i - X \right| \right)$

9. Standard deviation $= \sqrt{\frac{\sum (X_i - \bar{X})^2}{n-1}}$ or $\sqrt{\frac{\Sigma X^2 - \left[ (\Sigma X)^2 / N \right]}{N-1}}$

10. t-test $= \frac{\bar{X} - \mu}{\sigma / \sqrt{n}}$

11. $\chi^2$-test $= \sum \left( \frac{(O-E)^2}{E} \right)$ where $E_{ij} = \frac{O_i \times O_j}{N}$

12. t-table is attached.

13. $\chi^2$ test table is attached.

## Jadual t

**EXHIBIT G-2** Critical values of t for given probability levels

| | Level of significance for one-tailed test | | | | | |
|---|---|---|---|---|---|---|
| | .10 | .05 | .025 | .01 | .005 | .0005 |
| | **Level of significance for two-tailed test** | | | | | |
| **df** | **.20** | **.10** | **.05** | **.02** | **.01** | **.001** |
| 1 | 3.078 | 6.314 | 12.706 | 31.821 | 63.657 | 636.619 |
| 2 | 1.886 | 2.920 | 4.303 | 6.965 | 9.925 | 31.598 |
| 3 | 1.638 | 2.353 | 3.182 | 4.541 | 5.841 | 12.941 |
| 4 | 1.533 | 2.132 | 2.776 | 3.747 | 4.604 | 8.610 |
| 5 | 1.476 | 2.015 | 2.571 | 3.365 | 4.032 | 6.859 |
| 6 | 1.440 | 1.943 | 2.447 | 3.143 | 3.707 | 5.959 |
| 7 | 1.415 | 1.895 | 2.365 | 2.998 | 3.499 | 5.405 |
| 8 | 1.397 | 1.860 | 2.306 | 2.896 | 3.355 | 5.041 |
| 9 | 1.383 | 1.833 | 2.262 | 2.821 | 3.250 | 4.781 |
| 10 | 1.372 | 1.182 | 2.228 | 2.764 | 3.169 | 4.587 |
| 11 | 1.363 | 1.796 | 2.201 | 2.718 | 3.106 | 4.437 |
| 12 | 1.356 | 1.782 | 2.681 | 2.681 | 3.055 | 4.318 |
| 13 | 1.350 | 1.771 | 2.160 | 2.650 | 3.012 | 4.221 |
| 14 | 1.345 | 1.761 | 2.145 | 2.624 | 2.977 | 4.140 |
| 15 | 1.341 | 1.753 | 2.131 | 2.602 | 2.947 | 4.073 |
| 16 | | | | | | |
| 16 | 1.337 | 1.746 | 2.120 | 2.583 | 2.921 | 4.015 |
| 17 | 1.333 | 1.740 | 2.110 | 2.567 | 2.898 | 3.965 |
| 18 | 1.330 | 1.734 | 2.101 | 2.552 | 2.878 | 3.922 |
| 19 | 1.328 | 1.729 | 3.093 | 2.539 | 2.861 | 3.883 |
| 20 | 1.325 | 1.725 | 2.086 | 2.528 | 2.845 | 3.850 |
| 21 | 1.323 | 1.721 | 2.080 | 2.518 | 2.831 | 3.819 |
| 22 | 1.321 | 1.717 | 2.074 | 2.508 | 2.819 | 3.792 |
| 23 | 1.319 | 1.714 | 2.069 | 2.500 | 2.807 | 3.767 |
| 24 | 1.318 | 1.711 | 2.064 | 2.492 | 2.797 | 3.745 |
| 25 | 1.316 | 1.708 | 2.060 | 2.485 | 2.787 | 3.725 |
| 26 | 1.315 | 1.706 | 2.056 | 2.479 | 2.779 | 3.707 |
| 27 | 1.314 | 1.703 | 2.052 | 2.473 | 2.771 | 3.690 |
| 28 | 1.313 | 1.701 | 2.048 | 2.467 | 2.763 | 3.674 |
| 29 | 1.311 | 1.699 | 2.045 | 2.462 | 2.756 | 3.659 |
| 30 | 1.310 | 1.697 | 2.042 | 2.457 | 2.750 | 3.646 |
| 40 | 1.303 | 1.684 | 2.021 | 2.423 | 2.704 | 3.551 |
| 60 | 1.296 | 1.671 | 2.000 | 2.390 | 2.660 | 3.460 |
| 120 | 1.289 | 1.658 | 1.980 | 2.358 | 2.617 | 3.373 |
| ∞ | 1.282 | 1.645 | 1.960 | 2.326 | 2.576 | 3.291 |

***Sumber: Roger & Schindler, 'Business Research Methods 8th ed., McGraw Hill, 2004***

*The Chi Square Test*

The critical values of chi square given below show the probability that he calculated value of $x^2$ is the result of a chance distribution. The *larger* the value of $x^2$ the *smaller* is the probability that $H_0$ is correct.

| *df* | 0.10 | 0.05 | 0.01 | 0.001 |
|---|---|---|---|---|
| 1 | 2.71 | 3.84 | 6.64 | 10.83 |
| 2 | 4.60 | 5.99 | 9.21 | 13.82 |
| 3 | 6.25 | 7.82 | 11.34 | 16.27 |
| 4 | 7.78 | 9.49 | 13.28 | 16.27 |
| 5 | 9.24 | 11.07 | 15.09 | 18.46 |
| 6 | 10.64 | 12.59 | 16.81 | 22.46 |
| 7 | 12.02 | 14.07 | 18.48 | 24.32 |
| 8 | 13.36 | 15.51 | 20.09 | 26.12 |
| 9 | 14.68 | 16.92 | 21.67 | 27.88 |
| 10 | 15.99 | 18.31 | 23.21 | 29.59 |
| 11 | 17.28 | 19.68 | 24.72 | 31.26 |
| 12 | 18.55 | 21.03 | 26.22 | 32.91 |
| 13 | 19.81 | 22.36 | 27.69 | 34.53 |
| 14 | 21.06 | 23.68 | 29.14 | 36.12 |
| 15 | 22.31 | 25.00 | 30.58 | 37.70 |
| 16 | 23.54 | 26.30 | 32.00 | 39.29 |
| 17 | 24.77 | 27.59 | 33.41 | 40.75 |
| 18 | 25.99 | 28.87 | 34.80 | 42.31 |
| 19 | 27.20 | 30.14 | 36.19 | 43.82 |
| 20 | 28.41 | 31.41 | 37.57 | 45.32 |
| 21 | 29.62 | 32.67 | 38.93 | 46.80 |
| 22 | 30.81 | 33.92 | 40.29 | 48.27 |
| 23 | 32.01 | 35.17 | 41.64 | 49.73 |
| 24 | 33.20 | 36.42 | 42.98 | 51.18 |
| 25 | 34.38 | 37.65 | 44.31 | 52.62 |
| 26 | 35.56 | 38.88 | 45.64 | 54.05 |
| 27 | 36.74 | 40.11 | 49.96 | 55.48 |
| 28 | 37.92 | 41.34 | 48.28 | 56.89 |
| 29 | 39.09 | 42.56 | 49.59 | 58.30 |
| 30 | 40.26 | 43.77 | 50.89 | 59.70 |

From Siegel(1956); after Fisher and Yates (1953).
Refer modul 4, page 58.

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1. Terangkan maksud LIMA (5) perkara di bawah:

   (a) Skewness (5 markah)

   (b) Normal distribution (5 markah)

   (c) Interval data (5 markah)

   (d) Frequency distribution (5 markah)

   (e) Confidence interval (5 markah)

   (f) Significance level (5 markah)

   (g) Hypothesis testing (5 markah)

2. Bina satu jadual taburan dan lukiskan gambarajah histogram untuk data berikut.

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 32 | 35 | 42 | 33 | 36 | 38 | 37 | 33 | 38 | 36 | 35 | 34 | 37 | 40 | 38 | 36 | 35 | 31 | 37 | 36 | 33 |
| 36 | 39 | 40 | 33 | 30 | 35 | 37 | 39 | 32 | 39 | 37 | 35 | 36 | 39 | 33 | 31 | 40 | 37 | 34 | 34 | 37 |

(25 markah)

3. Di dalam satu kelas, setengah daripada pelajar dalam kelas tersebut telah diberi minum kopi dengan kafein dan setengah pelajar lagi diberi minum kopi tanpa kafein. Bilangan kekerapan pelajar menguap semasa syarahan telah direkodkan. Berpandukan senario ini dan data di jadual berikut, jawab soalan seterusnya.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Dengan Kafein | 3 | 5 | 0 | 12 | 7 | 2 | 5 | 8 |
| Tanpa Kafein | 8 | 9 | 17 | 10 | 4 | 12 | 16 | 11 |

   (a) Apakah penyataan masalah bagi senario di atas?

   (5 markah)

   (b) Nyatakan hipotesis nul dan hipotesis alternatif.

   (5 markah)

   (c) Uji hipotesis dengan 95% aras keyakinan.

   (15 markah)

4. Kira purata, sisihan piawai dan ujian-z bagi set data berikut:

43, 6, 7, 122, 41, 21, 17, 1, 3

(25 markah)

5. Data berikut dikumpul untuk menentukan sama ada hujan (inci) bergantung kepada kecerunan (kaki).

| Hujan (inci) | Kecerunan (kaki) |
|---|---|
| 36 | 400 |
| 78 | 800 |
| 11 | 200 |
| 45 | 675 |

(a) Berpandukan jadual di atas, uji hipotesis pekali regresi yang dikaitkan dengan pembolehubah tidak bersandar bersamaan dengan kosong. Guna 95% aras keertian.

(25 markah)

6. (a) Apa itu 'quadrat analysis'?

(10 markah)

(b) Senaraikan langkah-langkah dalam menjalankan kaedah 'quadrat analysis'.

(15 markah)

## SUKATAN KECENDERUNGAN MEMUSAT & SUKATAN SEBARAN

**Formula**

1. Rumus $\bar{X}$, sama ada $= \Sigma \frac{X}{N}$ atau $\bar{X} = \Sigma \frac{fx}{N}$ atau $\frac{1}{n} \Sigma fm$

2. Rumus $\hat{X}$ ialah $\hat{X} = L + \left( \frac{d_1}{d_1 + d_2} \right) c$ atau $L + \frac{cd_1}{d_1 + d_2}$

3. Rumus $\tilde{X}$ sama ada data ke $\frac{N+1}{2}$ atau $\hat{X} = L + \left( \frac{n}{2} - F \right) \frac{c}{f}$

4. Rumus untuk Jumlah Kelas = $K = 1 + 3.3 \log n$

5. Rumus Selang Kelas $= \frac{\text{Julat}}{K} + 1$

6. Rumus Julat = $J = m_T - m_R$

7. Rumus Sisihan Kuartil, sama ada $Q = ½ (Q_3 - Q_1)$ atau

$$Q_1 = L + \left( \frac{n}{4} - F \right) \frac{c}{f} \quad \& \quad Q_3 = L + \left\{ \frac{n}{4}(3) - F \right\} \frac{c}{f}$$

8. Rumus Sisihan Purata sama ada $= \frac{\left| \sum X_i \right|}{n}$ atau $= \frac{1}{n} \sum \left| X_i - \bar{X} \right|$ atau $\frac{1}{n} \sum_{i=1}^{k} f_i \left| X_i - \bar{X} \right|$

$$\text{atau } \frac{1}{n} \sum f_i \left( \left| m_i - X \right| \right)$$

9. Rumus Sisihan Piawai sama ada $= \sqrt{\frac{\sum \left( X_i - \bar{X} \right)^2}{n-1}}$ atau $\sqrt{\frac{\Sigma X^2 - \left[ (\Sigma X)^2 / N \right]}{N-1}}$

10. Ujian t $= \frac{\bar{X} - \mu}{\sigma / \sqrt{n}}$

11. Rumus Ujian Khi Kuasa Dua ($x^2$) $= \sum \left( \frac{(O-E)^2}{E} \right)$ di mana $E_{ij} = \frac{O_i \times O_j}{N}$

12. Jadual t dilampirkan

13. Jadual Ujian Khi-Kuasa Dua dilampirkan.

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## Jadual t

**EXHIBIT G-2** Nilai kritikal t untuk level Probabiliti

| | Tahap signifikan pada ujian satu hujung | | | | | |
|---|---|---|---|---|---|---|
| | **.10** | **.05** | **.025** | **.01** | **.005** | **.0005** |
| | **Tahap signifikan pada ujian dua hujung** | | | | | |
| **df** | **.20** | **.10** | **.05** | **.02** | **.01** | **.001** |
| 1 | 3.078 | 6.314 | 12.706 | 31.821 | 63.657 | 636.619 |
| 2 | 1.886 | 2.920 | 4.303 | 6.965 | 9.925 | 31.598 |
| 3 | 1.638 | 2.353 | 3.182 | 4.541 | 5.841 | 12.941 |
| 4 | 1.533 | 2.132 | 2.776 | 3.747 | 4.604 | 8.610 |
| 5 | 1.476 | 2.015 | 2.571 | 3.365 | 4.032 | 6.859 |
| 6 | 1.440 | 1.943 | 2.447 | 3.143 | 3.707 | 5.959 |
| 7 | 1.415 | 1.895 | 2.365 | 2.998 | 3.499 | 5.405 |
| 8 | 1.397 | 1.860 | 2.306 | 2.896 | 3.355 | 5.041 |
| 9 | 1.383 | 1.833 | 2.262 | 2.821 | 3.250 | 4.781 |
| 10 | 1.372 | 1.182 | 2.228 | 2.764 | 3.169 | 4.587 |
| 11 | 1.363 | 1.796 | 2.201 | 2.718 | 3.106 | 4.437 |
| 12 | 1.356 | 1.782 | 2.681 | 2.681 | 3.055 | 4.318 |
| 13 | 1.350 | 1.771 | 2.160 | 2.650 | 3.012 | 4.221 |
| 14 | 1.345 | 1.761 | 2.145 | 2.624 | 2.977 | 4.140 |
| 15 | 1.341 | 1.753 | 2.131 | 2.602 | 2.947 | 4.073 |
| 16 | | | | | | |
| 16 | 1.337 | 1.746 | 2.120 | 2.583 | 2.921 | 4.015 |
| 17 | 1.333 | 1.740 | 2.110 | 2.567 | 2.898 | 3.965 |
| 18 | 1.330 | 1.734 | 2.101 | 2.552 | 2.878 | 3.922 |
| 19 | 1.328 | 1.729 | 3.093 | 2.539 | 2.861 | 3.883 |
| 20 | 1.325 | 1.725 | 2.086 | 2.528 | 2.845 | 3.850 |
| 21 | 1.323 | 1.721 | 2.080 | 2.518 | 2.831 | 3.819 |
| 22 | 1.321 | 1.717 | 2.074 | 2.508 | 2.819 | 3.792 |
| 23 | 1.319 | 1.714 | 2.069 | 2.500 | 2.807 | 3.767 |
| 24 | 1.318 | 1.711 | 2.064 | 2.492 | 2.797 | 3.745 |
| 25 | 1.316 | 1.708 | 2.060 | 2.485 | 2.787 | 3.725 |
| 26 | 1.315 | 1.706 | 2.056 | 2.479 | 2.779 | 3.707 |
| 27 | 1.314 | 1.703 | 2.052 | 2.473 | 2.771 | 3.690 |
| 28 | 1.313 | 1.701 | 2.048 | 2.467 | 2.763 | 3.674 |
| 29 | 1.311 | 1.699 | 2.045 | 2.462 | 2.756 | 3.659 |
| 30 | 1.310 | 1.697 | 2.042 | 2.457 | 2.750 | 3.646 |
| 40 | 1.303 | 1.684 | 2.021 | 2.423 | 2.704 | 3.551 |
| 60 | 1.296 | 1.671 | 2.000 | 2.390 | 2.660 | 3.460 |
| 120 | 1.289 | 1.658 | 1.980 | 2.358 | 2.617 | 3.373 |
| ∞ | 1.282 | 1.645 | 1.960 | 2.326 | 2.576 | 3.291 |

***Sumber: Roger & Schindler, 'Business Research Methods 8th ed., McGraw Hill, 2004***

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Jadual bagi Ujian Khi-Kuasa Dua

*The Chi Square Test*

The critical values of chi square given below show the probability that he calculated value of $x^2$ is the result of a chance distribution. The *larger* the value of $x^2$ the *smaller* is the probability that $H_0$ is correct.

| *df* | 0.10 | 0.05 | 0.01 | 0.001 |
|---|---|---|---|---|
| 1 | 2.71 | 3.84 | 6.64 | 10.83 |
| 2 | 4.60 | 5.99 | 9.21 | 13.82 |
| 3 | 6.25 | 7.82 | 11.34 | 16.27 |
| 4 | 7.78 | 9.49 | 13.28 | 16.27 |
| 5 | 9.24 | 11.07 | 15.09 | 18.46 |
| 6 | 10.64 | 12.59 | 16.81 | 22.46 |
| 7 | 12.02 | 14.07 | 18.48 | 24.32 |
| 8 | 13.36 | 15.51 | 20.09 | 26.12 |
| 9 | 14.68 | 16.92 | 21.67 | 27.88 |
| 10 | 15.99 | 18.31 | 23.21 | 29.59 |
| 11 | 17.28 | 19.68 | 24.72 | 31.26 |
| 12 | 18.55 | 21.03 | 26.22 | 32.91 |
| 13 | 19.81 | 22.36 | 27.69 | 34.53 |
| 14 | 21.06 | 23.68 | 29.14 | 36.12 |
| 15 | 22.31 | 25.00 | 30.58 | 37.70 |
| 16 | 23.54 | 26.30 | 32.00 | 39.29 |
| 17 | 24.77 | 27.59 | 33.41 | 40.75 |
| 18 | 25.99 | 28.87 | 34.80 | 42.31 |
| 19 | 27.20 | 30.14 | 36.19 | 43.82 |
| 20 | 28.41 | 31.41 | 37.57 | 45.32 |
| 21 | 29.62 | 32.67 | 38.93 | 46.80 |
| 22 | 30.81 | 33.92 | 40.29 | 48.27 |
| 23 | 32.01 | 35.17 | 41.64 | 49.73 |
| 24 | 33.20 | 36.42 | 42.98 | 51.18 |
| 25 | 34.38 | 37.65 | 44.31 | 52.62 |
| 26 | 35.56 | 38.88 | 45.64 | 54.05 |
| 27 | 36.74 | 40.11 | 49.96 | 55.48 |
| 28 | 37.92 | 41.34 | 48.28 | 56.89 |
| 29 | 39.09 | 42.56 | 49.59 | 58.30 |
| 30 | 40.26 | 43.77 | 50.89 | 59.70 |

From Siegel(1956); after Fisher and Yates (1953).
Rujuk Modul 4, ms 58

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