UNIVERSITI SAINS MALAYSIA

Second Semester Examination
Academic Session 2007/2008

April 2008

ZGT 264/2 – Geophysical Data Analysis
[Analisis Data Geofizik]

Duration: 2 hours
[Masa : 2 jam]

Please ensure that this examination paper contains **THREE** printed pages before you begin the examination.
[Sila pastikan bahawa kertas peperiksaan ini mengandungi TIGA muka surat yang bercetak sebelum anda memulakan peperiksaan ini.]

Instruction: Answer all **FOUR** questions. Students are allowed to answer all questions in Bahasa Malaysia or in English.

[Arahan: Jawab semua EMPAT soalan. Pelajar dibenarkan menjawab semua soalan sama ada dalam Bahasa Malaysia atau Bahasa Inggeris.]

1. Write short notes on the following topics:
    [Tulis nota ringkas tentang tajuk-tajuk berikut:]

    (a) Determination of the delay properties of wavelets.
         [Penentuan sifat-sifat tunda bagi gelombang kecil.]

    (b) Digital sampling and Nyquist frequency.
         [Pensampelan digit dan frekuensi Nyquist.]

    (c) The role of convolution in data analysis.
         [Peranan konvolusi dalam analisis data.]

    (100/100)

2. (a) Let the input wavelet be (2, -1). Compute the inverse filter (3 point filter) and apply it to the input wavelet. Calculate the error energy of the actual output.
         [Andaikan gelombang kecil input (2, -1). Hitung penuras songsang (penuras 3 titik) dan gunakannya pada gelombang kecil tersebut. Hitung tenaga ralat bagi output sebenar.]

    (60/100)

    (b) Describe the low and high pass filters.
         [Perihalkan penuras-penuras laluan rendah dan tinggi.]

    (40/100)

3. (a) Prove the convolution theorem.
         [Buktikan teorem konvolusi.]

    $$f_1(t).f_2(t) \leftrightarrow \frac{1}{2\pi} F_1(\omega) * F_2(\omega)$$

    (40/100)

    (b) A periodic function is given by
         [Fungsi berkala diberikan oleh]

    $f(t) = 0$ if $-T < t < 0$

    $= E\sin\omega t$ if $0 < t < T$

    Period $= 2T = 2\pi / \omega$, $T = \pi / \omega$

Determine the coefficients a_o and a_n in the Fourier series of the function.
[Tentukan pekali a_o dan a_n dalam siri Fourier dalam fungsi tersebut]

(60/100)

4. Use a suitable transformation to create a linear model (Table 1). Determine the coefficients a and b by using a least-squares regression technique.
    [Gunakan tranformasi yang sesuai untuk menjana model linear (Jadual 1). Hitung pekali a dan b secara teknik regresi kuasa-dua terkecil]

Table 1. The xy-relationship is of the form $y=ae^{bx}$

x	y
1	7250
2	6175
3	5200
4	4400
5	3825

(100/100)

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