UNIVERSITI SAINS MALAYSIA

Second Semester Examination
Academic Session 2006/2007

April 2007

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

Duration: 2 hours
[Masa : 2 jam]

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

*[Sila pastikan bahawa kertas peperiksaan ini mengandungi **EMPAT** 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 kesemua **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) Sampling and aliasing
[Pensampelan dan pengaliasan]

(b) Applications of Fourier transform in geophysical data analysis
[Penggunaan jelmaan Fourier dalam analisis data geofizik]

(c) Frequency filtering
[Penurasan frekuensi]

(100/100)

2. (a) Given the samples of $f(t)$ shown (Figure 1), compute the DFT, $F(k\Omega)$. Determine the phase angle for each $F(k\Omega)$.
[Diberikan sample-sampel f(t) yang ditunjukkan (Rajah 1), hitung DFT, F(kΩ). Tentukan sudut fasa bagi setiap F(kΩ)]

(60/100)

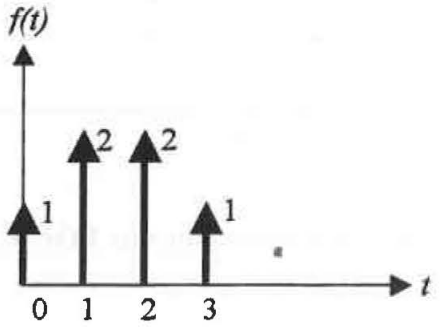

Figure 1. Samples of $f(t)$.
[Rajah 1. Sampel f(t)]

(b) Find the Laplace transform of the square wave shown in Figure 2.
[Cari jelmaan Laplace bagi gelombang segi empat sama yang ditunjukkan dalam Rajah 2.]

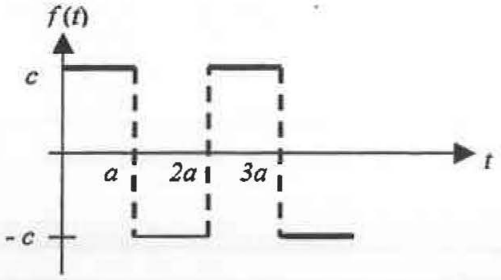

Figure 2. Periodic square wave (period=2a).
[Rajah 2. Gelombang segi empat sama berkala (kala=2a)]

(40/100)

...3/-

3. (a) Given two wavelets, $a = (a_0, a_1, a_2, a_3)$ and $b = (b_0, b_1, b_2)$. Describe (i) the convolution of a and b using z-transform method and (ii) correlation between the wavelets using folding operation.
[Diberikan dua gelombang kecil $a = (a_0, a_1, a_2, a_3)$ dan $b = (b_0, b_1, b_2)$. Jelaskan (i) konvolusi a dan b secara jelmaan-z dan (ii) korelasi di antara dua gelombang tersebut secara kaedah lipatan]

(40/100)

(b) Determine the output of a filter of impulse response function (1, -½, ¼) when input seismic wavelet (3, -2, 1) is applied.
[Tentukan output bagi satu penuras yang mempunyai fungsi sambutan impuls (1, -½, ¼) apabila diberikan input gelombang kecil seismik (3, -2, 1).]

(30/100)

(c) Given two functions, (2, 5, -2, 1) and (6, -1, -1). For what shift are these functions most nearly alike?
[Diberikan dua fungsi, (2, 5, -2, 1) dan (6, -1, -1). Pada anjakan manakah fungsi tersebut hampir serupa?]

(30/100)

4. Heating and combustion analyses were performed in order to study the composition of moon rocks. Recorded here are the determinations of hydrogen (H) and carbon (C) in parts per million (ppm) for 8 specimens.
[Analisis pemanasan dan pembakaran dilakukan untuk mengkaji kandungan batu-batu dari bulan. Tercatat di bawah adalah penentuan hydrogen (H) dan karbon (C) dalam bahagian per juta (ppm) untuk 8 spesimen]

Hydrogen, H (ppm)	120	82	90	8	38	20	2.8	66
Carbon C (ppm)	105	110	99	22	50	50	7.3	74

Create a table containing the required parameters for statistical computations.
[Jadualkan parameter-parameter yang diperlukan untuk penghitungan statistic]

(50/100)

Calculate
[hitung]

(i) the corrected sum of squares for H, S_{HH}
[hasiltambah kuasa-dua yang diperbetulkan bagi H, S_{HH}]

(ii) the corrected sum of squares for C, S_{CC}
[hasiltambah kuasa-dua yang diperbetulkan bagi C, S_{CC}]

(iii) the corrected sum of products, S_{HC}
[hasiltambah bagi hasildarab yang diperbetulkan, S_{HC}]

(iv) the covariance between H and C, COV_{HC}
[kovarian di antara H dan C, COV_{HC}]

(v) the sample correlation coefficient, R
[pekali korelasi sample, R.]

(50/100)

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