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| King Fahd University |  | of Petroleum & Minerals |

Electrical Engineering Department

EE 207 Signals and Systems

**Second Semester (112)**

**Exam II**

**Saturday, 21 April 2012**

**7:00 pm – 9:00 pm**

**Name:**

**ID:**

**Section:**

**Instructors:**

**Dr. Azzedine Zerguine (Section 1)**

**Dr. Mohamed Deriche (Section 2)**

**Dr. Adil Balghonaim (Sections 3 & 5)**

**Dr. Wajih Abu-Al-Saud (Section 4)**

|  |  |  |
| --- | --- | --- |
| Problem | Score | Out of |
| 1 |  | 30 |
| 2 |  | 35 |
| 3 |  | 35 |
| Total |  | 100 |

Good luck!

**Problem 1:** [30 points]

A signal  has complex exponential Fourier series expansion



a) Sketch magnitude and phase line spectra of  showing all important values on the sketchs.

|  |  |  |  |
| --- | --- | --- | --- |
| *k* |  |  |  |
| -2 |  |  |  |
| -1 |  |  |  |
| 0 |  |  |  |
| 1 |  |  |  |
| 2 |  |  |  |

Magnitude Spectrum Phase Spectrum

 

b) find the average power *P* of the signal .



c) Find the trigonometric Fourier series coeficients *A*0, *A*1, *B*2, and *B*3



d) Sketch the magnitude line spectrum of the siganl  showing all important values on the sketchs.

Magnitude Spectrum



**Problem 2:** [35 points]

a) The signal  has a Fourier transform



Find the Fourier tranform of the

1. 



1. 



1. 



b) The signal  has a Fourier transform  given by



The signal  is related to  by the relation . Find the total energy

 of the signal .

Since , the F.T. of  can be written as



So,



Total Energy of  is



**Problem 3:** [35 points]

a) A simple circuit used as a filter is shown below



1. Determine the frequency response of the system above, , assuming *R*/*L* = 3,



1. Plot the magnitude and phase of  over the frequency range –16 to 16 rad.



Magnitude Phase

 

1. Explain what type of filters the circuit represents? Why?

The filter is a lowpass filter (LPF) because it passes low frequencies around 0 rad/s un-attenuated and stops high frequencies.

1. Determine the exact value of the 3-dB (half-power) cut-off frequency.



So, the 3-dB cutoff frequency (Bandwidth of the LPF) is 

b) A linear time-invariant (LTI) system has the following impulse response



1. Find the systems transfer function 



1. Without using convolution, find the output of the system  if input to the system is







1. Without using convolution, find the output of the system  if input to the system is



Write the answer in the simplest form.



