

① a- Write short notes on: signals - systems - system response.

b- solve the following differential equation using Laplace transform

$$y''(t) + 3y'(t) + 2y(t) = 3\delta(t)$$

c- Test the stability of a system whose characteristic equation is given by:

$$s^7 + 2s^6 + 2s^5 + s^4 + 4s^3 + 8s^2 + 8s + 4 = 0$$

② a- Find the transfer function of the electric circuit shown, assuming the input is $V_i(t)$ and the output is $V_o(t)$.

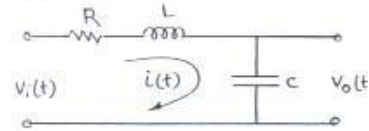


Fig. 1

b- Draw signal flow graph of the system shown in Fig. 2 and then find its transfer function using Mason's gain formula.

③ a- A linear system has an impulse response given by $h(t) = t e^{-t} u(t)$. If the excitation signal is $f(t) = e^{-t} u(t)$. Find the Fourier transform of its response.

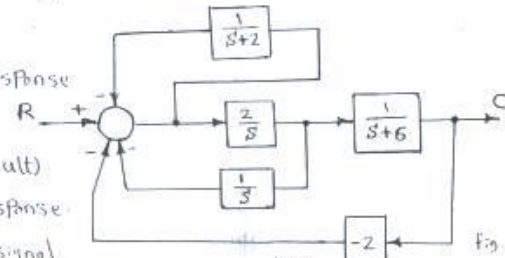


Fig. 2

b- Find the Fourier transform of the signal shown in Fig. 3.

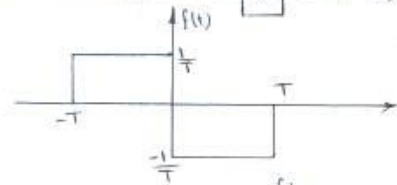


Fig. 3

④ a- Find the Z transform of the following discrete impulse sequence

$$\{1, 2, -1, 3, 4, -2\}$$

b- In the following difference equation $X(n)$ is the input to a linear shift invariant system and $Y(n)$ is its output

$$Y(n) = 0.1X(n) + 0.5X(n-1) - 0.6X(n-2) + 0.3Y(n-1) + 0.5Y(n-2) + 0.7Y(n-3)$$

i- obtain its transfer function $G(Z)$.

ii- Draw its signal flow graph and

iii- Drive its state variable model.

تعاريف
اشكال

Tanta University
Faculty of Engineering
Time allowed: 2 Hours

2nd year Electronics & Comm.
Technical Reports
(Jan 2008)

Question (1)

- a. Write a document describing what you think is the most significant problem on your college. Use the Bottom line up front (BLUF) technique when writing this document.
 - b. Correct the following expressions:
 - (i) This design alternative was selected because it seems the most cost effective.
 - (ii) The processor was not able to efficiently handle the data
 - (iii) The shift in data is because there was a sharp change in temperature.
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Question (2)

- a. Choose any product that you think has problems from an environmental standpoint. Create a brief brainstorming list of topics that would be included in a report about the product.
 - b. Create checklists for the following types of documents:
 - (i) An executive summary
 - (ii) An experimental report
 - (iii) A proposal
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Question (3)

- a. Describe common types of graphs and charts you may encounter. State when and where each should be used in technical reports.
 - b. Give an example of organizational charts that might be used in technical report.
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Good Luck

Answer the following questions:

1- a- Draw the spectrum of waveform shown in figure and calculate the signal power.

b- What is the Fourier transform of;

$$f(t+t_d), f\left(\frac{t}{a}\right)$$

2-a- Define the following;

Sky wave, Nonlinear System, Master group, Frequency deviation.

b- Discuss the following;

Practically, the amplitude modulation index neither equal zero nor one.

3-a- An amplitude modulated carrier signal is transmitted with power 32 Watt, with modulation index 0.9. Write the equation of the modulated signal, and define its main problems.

b- Show the effect of decreasing the modulation index value.

4-a- Discuss the negative peak clipping distortion, and how to minimize it.

b- Show the effect of the phase change in the carrier used in the DSB-SC demodulation and that used in the modulation.

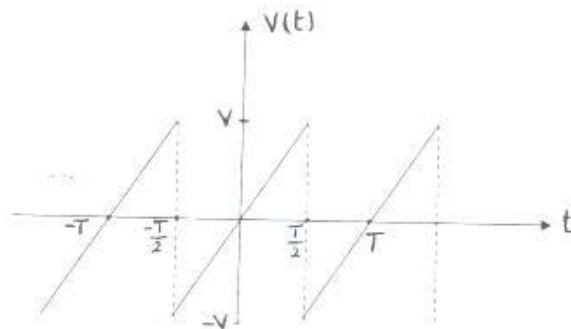
5- A receiver picked up the signal;

$$V(t) = 15 \cos [8 \pi \times 10^6 t + 1.2 \sin 1200 \pi t],$$

a- Calculate the bandwidth of the received signal.

b- Calculate the signal power with modulating signal amplitude 4 volt.

c- Show the effect of changing the frequency deviation to 350 Hz.



Answer all the following:

Q1)

- A) Draw the circuit diagram of the variable attenuator. Write only without derivation an expression for the attenuator resistance.
- B) Find the characteristic resistance of the symmetrical T-attenuator with $R_1 = 25 \Omega$ and $m = 1.4$. Prove that the input resistance of the attenuator is 48.732Ω when the attenuator is loaded by its characteristic resistance.
- C) Design a 80 dB , 50Ω attenuator using four symmetrical T-sections.

Q2)

- A) Draw the circuit diagram of the band stop filter. Drive an expression for the cutoff frequency. Draw also the frequency response of the filter.
- B) With aid of circuit diagram, explain the theory of operation of the chopper modulated amplifier.
- C) Find the pass band gain and the cutoff frequency of a high pass filter with $R = 100 \text{ K}\Omega$, $C = 500 \text{ PF}$, $R_1 = 20 \text{ K}\Omega$, and $R_2 = 150 \text{ K}\Omega$.

Q3)

- A) Draw the circuit diagram of a slicer circuit. Draw also the output waveform, if the input is sinusoidal waveform.
- B) Define the total harmonic distortion of a complex wave. Draw the circuit diagram of a resonant circuit harmonic analyzer.
- C) In an amplifier, six identical stages are cascaded. The lower and upper cutoff frequencies of each stage are 100 Hz and 100 KHz respectively. Find the lower and upper cutoff frequencies of the amplifier.

Q4)

- A) Draw the block diagram of the function generator. Show on your graph the different output waveforms of the generator.
- B) What is the function of wave analyzer? Draw its simple circuit diagram. Write an expression of the deflection. What is the maximum deflection of the analyzer?
- C) A complex wave has the following: $Y_{30} = 315$, $Y_{60} = 305$, $Y_{90} = 330$, $Y_{120} = 390$, and $Y_{150} = 305$. Determine the amplitudes of the fundamental, 3rd, and 5th harmonics and write the equation of the complex wave using summation method with grouped terms.

Q5)

- A) With aid of circuit diagram, explain the operation of a practical flip-flop. What are the functions of diodes and capacitors?
- B) Draw the circuit diagram of the binary and decimal counters. Write only the truth table of each counter.
- C) What are the modes of operation of the universal counter? With aid of block diagram explain how you can measure the frequency of a sinusoidal input signal.