Problem number (3) **(15 Marks)**

a) Consider the following characteristic polynomial **[6 Marks]**

$$Q(s) = s^4 + s^3 - s - 1$$

Apply Routh stability criterion to find the distribution of the poles in the s-plane and to check the stability of the system.

b) The overall transfer function of a closed loop system is given by **[9 Marks]**

$$T(s) = \frac{50}{s(1+ks)(1+0.5s)+50}$$

Find the value of k for the system to be critically stable, and then find the frequency of oscillation.

Problem number (4) **(20 Marks)**

a) Find the peak time, maximum overshoot, and rise time of the following systems **[10 Marks]**

(i) A system with transfer function $T(s) = \dfrac{100}{s^2 + 15s + 100}$

(ii) A second order system with poles at $-2 + j2$ and $-2 - j2$

b) For a unity feedback system which have the open-loop transfer function **[10 Marks]**

$$G(s) = \frac{10k}{(s+1)(s+2)(2s+1)}$$

(i) Find the step, ramp, and parabolic error coefficients and the corresponding steady-state errors for $k = 1$.

(ii) It is desired that, for unit step input, the steady state error $e_{ss} \leq 0.1$, find the range of k, which is investigating this requirement while maintaining the stability of the system.

Problem number (5) **(25 Marks)**

a) For the following system **[15 Marks]**

$$\dot{x}(t) = \begin{bmatrix} 0 & 1 \\ -4 & -5 \end{bmatrix} x(t) + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u(t)$$

$$y(t) = \begin{bmatrix} 1 & 1 \end{bmatrix} x(t)$$

Find,

(i) The state transition matrix.

(ii) The transfer function.

(iii) The response of the system $y(t)$ for unit impulse input and zero initial condition.

b) For the system that have the following transfer function **[10 Marks]**

$$\frac{Y(s)}{U(s)} = \frac{s^2 + 15s + 50}{(s+1)(s^2 + 6s + 8)}$$

(i) Obtain the state space model.

(ii) Determine whether the system in (i) is controllable and observable or not.

GOOD LUCK

Dr. Ali Abu Tahoun

Tanta University

Department: Computer and Control Engineering
Total Marks: 90 Marks

Faculty of Engineering

Course Title: Signals and Systems	Course Code: CCE2210	Year: 2nd
Date: June 26th 2011 (Second term)	Allowed time: 3 hrs	No. of Pages: (2)

Remarks: (Answer the following questions)

Problem number (1) **(10 Marks)**

a) Define the following terms **[6 Marks]**

- Controllability - Observability - Open-loop and closed-loop systems
- Stability - Causality - Transfer function

b) Let $h(t)$ be the unit impulse response of an LTI system, where **[4 Marks]**

$$h(t) = u(t-2) - u(t-4)$$

Find the output response using the convolution integral for the following input

$$x(t) = u(t) - 2u(t-1) + u(t-2)$$

Problem number (2) **(20 Marks)**

a) Figure 1 shows a schematic diagram of an armature–controlled DC servomotor **[10 Marks]**

(i) Find the differential equations,

(ii) Draw the block diagram, then

(iii) Find the transfer function

(θ(s)/V_a(s))

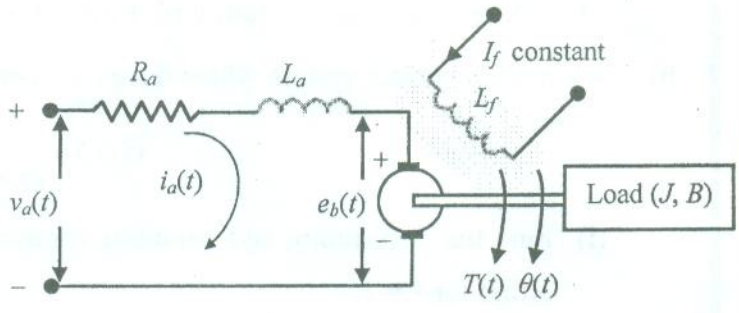


Figure 1

b) A simple lumped model of the national income الدخل القومى feedback control system is shown in Figure 2. This type of model helps the analyst to understand the effects of government control and the dynamic effects of government spending الإنفاق الحكومي. **[10 Marks]**

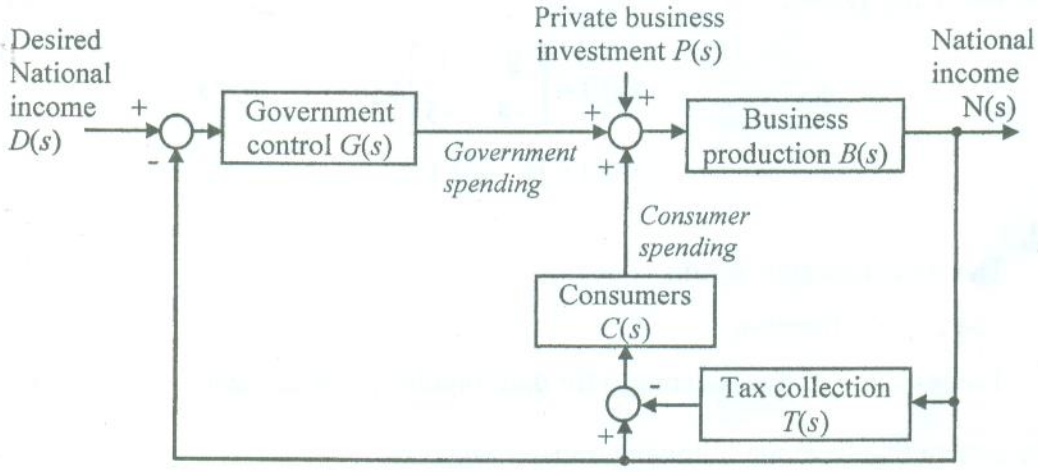


Figure 2

Find the output (National income $N(s)$) as a function of the inputs (desired national income $D(s)$ and private business investment الاستثمار $P(s)$).

P.T.O.

Question 4 (15 marks)

What is hierarchical modeling? What are its advantages? (5 marks)

Write an OpenGL program to draw a rectangle of size 3 by 3 units each time the mouse is left-clicked with a color chosen randomly. The program terminates when the user right-click the mouse. Your program should interact correctly even if the user changes the window size. (10 marks)

Question 5 (15 marks)

a) In the context of OpenGL programming, explain the following (5 marks)
   i. Picking
   ii. Interactive modeling

b) If you know the following:

The two-dimensional point (in a Cartesian coordinates):$x = cos(\theta)$, $y = sin(\theta)$ lies on a unit circle regardless of the value of θ. Also, the three points (- sin (θ), cos (θ)), (- cos (θ), - sin (θ)), and (sin (θ), - cos (θ)) lie on the unit circle. These four points are equidistant along the circumference of the circle. By connecting the four points we get a square that has a side length of $\sqrt{2}$. This is true for any value of θ.

Write an OpenGL program that draw a rotating square using the above information

Good Luck

Course Coordinator: Dr. Hamed Hemeda

And the examination committee

Title: Computer graphics
Course code: CCE2211 **Year:** Second year
Final exam, Date: 19/6/2011, **Total marks:** 75 **Allowed time:** 3 hours **Number of pages:** 2

Workout the following questions

Question 1 (15 marks)

a) What is *Computer Graphics* and how it's different from *Image Processing?* (5 marks)

b) A graphics programmer or designer works with some interfaces or APIs to produces graphics. Two conceptual models could be used to describe the interaction between the programmer/designer and the interface/API: pen-plotter model and the 3D graphics model. Explain the difference between the two models (5 marks)

c) The memory in a frame buffer must be fast enough to allow the display to be refreshed at a rate sufficiently high to avoid flicker. A typical workstation display can have a resolution of 1280 x 1024 pixels. If it is refreshed 72 times per second, how fast must the memory be? That is, how much time can we take to read one pixel from memory? What is this number for a 480 x 640 display that operates at 60 Hz but is interlaced? (5 marks)

Question 2 (15 marks)

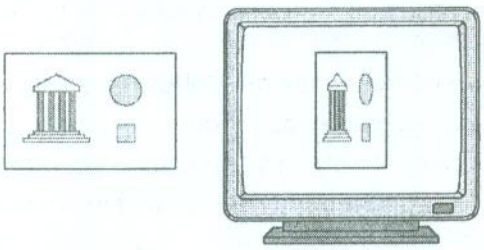
a) OpenGL output is strictly specified and will predictable when we model our objects using *simple, convex and flat* polygons. What is a flat polygon? What is a simple polygon? What is a convex polygon? Give example in drawing when possible. (5 marks)

b) Write an OpenGL program the draw a sphere centered at the origin with a unit radius. Explain in drawing how you approximate the sphere in primitives that OpenGL can draw. (10 marks)

Question 3 (15 marks)

a) The following figure shows a scene that appears deformed when displayed on the output screen of an OpenGL program

   i. Discuss possible reasons that could lead to the shown deformation
   ii. How you can avoid such deformations?



b) Write an OpenGL program to draw a damped sine function four times, each in a separate quarter in the output graphics window. Hint; use the viewport setting to change the location and size of the output graphics area with respect to the output graphics window. (10 marks)

Problem(4) (37)M

(a) **Define and illustrate with examples:**

Fuzzy set – The concentration of a fuzzy set .

(b) **Let A be a fuzzy set defined by**

$A = \frac{0.5}{x_1} + \frac{0.4}{x_2} + \frac{0.7}{x_3} + \frac{0.8}{x_4} + \frac{1}{x_5}$ **. List all α-cuts and strong α-cuts of A.**

Find the core of A.

(c) **By examples illustrate the following statement: In afuzzy set Operations, the laws of contradiction and excluded middle are not applicable in general .**

(d) **Given P and Q are two relations from A to B and from B to C respectively defined by**

$$M_P = \begin{bmatrix} 0.3 & 0.5 & 0.8 \\ 0 & 0.7 & 1 \\ 0.4 & 0.6 & 0.5 \end{bmatrix}, \quad M_Q = \begin{bmatrix} 0.9 & 0.5 & 0.7 & 0.7 \\ 0.3 & 0.2 & 0 & 0.9 \\ 1 & 0 & 0.5 & 0.5 \end{bmatrix}$$

calculate M_{PoQ}

Course Title: Complex and Special Functions
Date: 2011 (2nd term)

Year: 2nd (comp-)
Allowed time: 3hrs

Problem number (1) (32) M

(a) show that $1+\cos\theta+\cos 2\theta+\ldots\ldots+\cos n\theta=\frac{1}{2}+\frac{Sm(n+\frac{1}{2})\theta}{2Sm\frac{\theta}{2}}$

(c) Find all values of $\sinh(2+2i)^{i}$.

(d) If $f(z)=u+iv$ is analytic and $u=consant$ then f`(z)=constant .

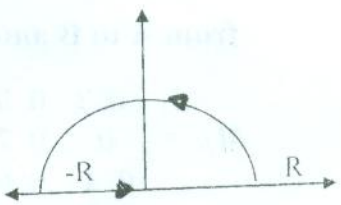
Problem number (2) (32) M

(a) Evaluate $\int_C \frac{z^3+z+6}{(z-1)(z-4)}dz$, $C:|z|=3$.

(b) Evaluate $\int_C \frac{\cosh 3z}{(z-i)^3}dz$, $C:|z-1|=5$.

(c) Evaluate

$\int_{-\infty}^{\infty}\frac{\cos 3x}{x^4+4}dx$ On the contour ($R\to\infty$)



Problem number (3) (49) M

a) Show that

(i) $J_0'''(x) = \frac{J_0(x)}{x}+\left(\frac{2}{x^2}-1\right)J_0'(x)$

(ii) $\beta\left(n+\frac{1}{2},\frac{1}{2}\right)=\frac{(2n)!\ \pi}{2^{2n}\ (n!)^2}$

(b) Evaluate (i) $\int_3^{\infty} e^{6x-x^2}dx$

(ii) $\int_0^2 x\ \sqrt[4]{(16-x^4)}\ dx$

(iii) $\int_0^1 x(1-x^2)J_0(kx)dx$

(c) Find Fourier-Bessel Series of

$f(x)=\frac{1}{8}(1-x^2)\quad 0\le x\le 1$, $J_0(\mu_k x)=0$, $f(x)=\sum_{k=0}^{\infty}A_k J_0(\mu_k x)$

With my best wishes

Dr: M.Shokry

Tanta University
Faculty of Engineering
Computer and Control Dep.
Second Year

Second Term – Final Exam
Subject: Computer Architecture
Allowed Time: 3 Hours
Date: June 15, 2011

Answer the following 2 questions and assume any missing data:

Question 1: [Computer Arithmetic] — 45 Marks

1. Design 8-bit carry look-ahead adder with minimum gate delay that adds $x_{0\text{-}7}$ to $y_{0\text{-}7}$ then produces $s_{0\text{-}7}$ and c_8. After that compute the delay of s_7 and c_8 in milliseconds (msec) assuming that the delay of each OR gate is 3 msec, each AND gate 5 msec, and each NOT gate is 2 msec.

(15 Marks)

2. Multiply 0110100 × 11110110 using:
   a. Booth Algorithm
   b. Bit pairing recording of multipliers

(10 Marks)

3. Draw the hardware circuit that can perform integer division, and then write the algorithms for both the restoring and non-restoring division. Show how the second algorithm is driven from the first then use the non-restoring algorithm to divide: 1100 0001 ÷ 1010.

(10 Marks)

4. Use 32-bit IEEE standard for floating point numbers to represent the following numbers in binary:
   a. $(+ 23.125)_{10}$
   b. $(- 141.25)_{10}$
   c. ∞
   d. $(- 0.001100 \times 2^{-126})_2$

(10 Marks)

Question 2: [Input/Output Organization] — 45 Marks

1. Design a centralized bus arbitration system that applies daisy chain between 4 I/O devices assuming that all control devices are active high. Then draw the time sequence of signals that transfer the bus mastership to device number 2.

(10 Marks)

2. Draw and explain the handshake control signals of data transfer over asynchronous bus during an output operation.

(10 Marks)

3. Discuss the operation of the Direct Memory Access showing the functions of its interface registers.

(10 Marks)

4. Design an interface circuit between the processor and a printer assuming that the computer has 32-bit address bus, 16-bit data bus, status flag bit is transferred over line D_{15} of the data bus, and address line A_{31} is used as control signal, then design the logic circuit that can generate the status flag bit properly.

(15 Marks)

Good Luck

Dr. Tarek El.Ahmady El.Tobely

(8) What is the output that is generated from the following Latex code:

```
\title{A Very Simple \LaTeX{} Template}
\author{
    2nd year student \\
        Department of Computers $& Control Science\\
    Tanta University\\
    Tanta City, \underline{Egypt}
}
\date{\today}

\documentclass[12pt]{article}

\begin{document}
\maketitle

\begin{abstract}
This is the paper's abstract
\end{abstract}

\section{Introduction}
This is time to work hard.

\begin{equation}
\label{eq5}
C(A)=\sum _{s=1}^{n}b_{s}(G_{s})
\end{equation}

Section~\ref{previous work} gives account of previous work.
Our new and exciting results are described in Section~\ref{results}.
Finally, Section~\ref{conclusions} gives the conclusions.

\section{Previous work}\label{previous work}
A much longer \LaTeX example was written by Gil~\cite{Gil:02}.

\begin{itemize}
\item $F$ is a partial-ordering of $E$.
\item For any $e \in E$ , $v is well-ordering.
\end{itemize}
\section{Results}\label{results}
In this section we describe the results.

\section{Conclusions}\label{conclusions}
We worked very hard.

\bibliographystyle{abbrv}
\bibliography{main}

\end{document}
```

Good Luck

Dr. Ahmed Elmogy

Answer the following questions:

(1) What is SCADA? Give an example to explain how SCADA systems work?

(2) Explain what is meant by the following:

Polymorphic code – Virus self-modification – Stealth – cavity viruses – Cyclic redundancy checks – Resident viruses.

(3) What are the goals of green technology?

(4) Make up the HTML document that will give the following table:

DRILL SPEEDS

	MATERIALS	DIAMETER IN INCHES	CUTTING SPEED		RPM
			Feet	Metres	
1.	Brass	2.5	350		560
2.	Cast iron	4.5		69	201
3.	Copper	1	300		1200
4.	Stainless Steel	3.625		46	167

Design a photo background for your page. Make your design jump to another webpage when you press each of the underlined words.

(5) What is cloud computing? Explain the basic types of cloud computing?

(6) Write a Matlab function 'check' that takes a vector as input and prints an error message unless every component is nonzero?

(7) Write a Matlab function to evaluate the function $y = sin^2(x^2)$. Plot the function.

Question (3) (20 degrees)

(1)Explain with the mathematical representation, how the switching modulator can be used to generate the AM wave.

(2) If a carrier wave $c(t)=A_c \cos(2\pi f_c t)$ is amplitude modulated by a baseband signal m(t), show how you can obtain a DSB-SC wave by using a double balanced modulator.

(3) For the baseband signal $m(t)=2\cos(2000\pi t)$, determine the following:

(a) The spectrum of $m(t)$.

(b) The spectrum of the DSB-SC signal $m(t)\cos(20{,}000\pi t)$.

(c) Identify the frequencies in the baseband, and the corresponding frequencies in the USB and LSB spectra.

(d) Show how you can recover the baseband signal from the DSB-SC wave.

Question (4) (20 degrees)

(1) State the benefits of using SSB modulation over the DSB modulation.

(2) Shows with the block diagram, how you can generate the SSB wave by using the phase discrimination method.

(3) A SSB-AM wave is modulated with the baseband signal $m(t) = 5\cos(1000\pi t),$, with $A_c = 1$.

(a) Evaluate $\hat{m}(t)$.

(b) Find the expression for a lower SSB signal.

(c) Sketch the amplitude spectrum of $|S(f)|$.

(d) Find the normalized average power of the SSB signal.

Question (5) (20 degrees)

(1) Design FM transmitter that is based on the indirect method to transmit audio signals containing frequencies in the range of 50 Hz to 15 kHz. The narrow-band phase modulator is supplied with a carrier wave of frequency $f_1 = 0.2MHz$. Assume the final carrier frequency of the FM required is $f_c = 100MHz$, the maximum frequency deviation $\Delta f = 75kHz$ and the frequency of the intermediate crystal oscillator $f_2 = 8.5MHz$.

(2) Show with the block diagrams the types of FM wave's demodulators and the principal of the operation of each one.

(3) A single-tone FM signal is given by $s(t) = 10\sin[16\pi \times 10^6 t + 20\sin(2\pi \times 10^3 t)]volts$. Determine the modulation index, frequency deviation, the carrier power, and calculate the bandwidth of the FM signal using Carson's rule.

.....

Good Luck

Dr. *Entessar Said*

Course Title: Communication systems	Course Code: EEC2247	Second Year
Date: June 24, 2011 (second term)	Allowed time: 3 hrs	No. of Pages: (2)

Answer all the following questions:

Question (1) (20 degrees)

(1) Find the trigonometric Fourier series for the periodic waveform shown in Figure (1).

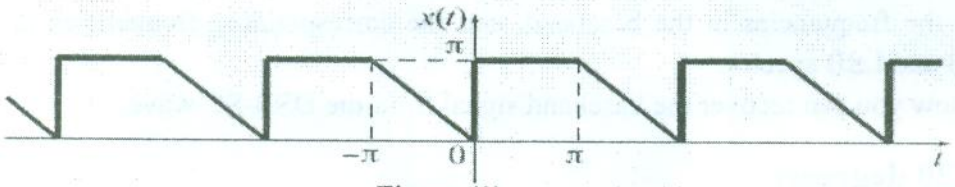


Figure (1)

(2) Find the complex Fourier series and the PSD for the periodic square waveform shown in Figure (2).

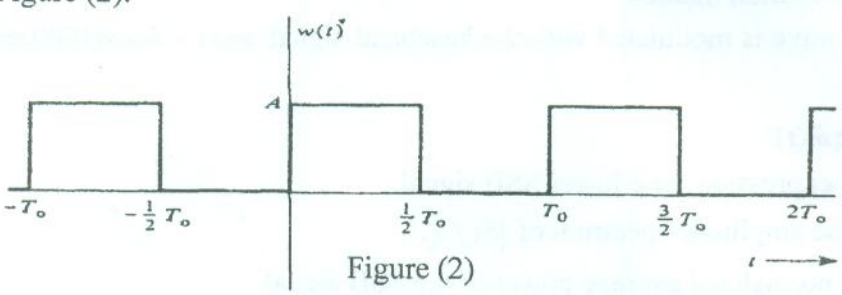


Figure (2)

(3) Use the Fourier series representation of a periodic train of impulses to prove that

$$\sum_{n=-\infty}^{\infty}\delta(t-nT)=\frac{1}{T}\sum_{n=-\infty}^{\infty}e^{j2\pi nft}$$

then, find its Fourier transform and draw its spectrum.

(4) State the Parseval's theorem and the Dirichlet's conditions.

Question (2) (20 degrees)

(1) Determine the Fourier transform of the following function:

(a) $x(t)=(\cos(5t)+e^{-2t})u(t)$

(b) $rect.(\frac{t-2}{4})+8\sin(6\pi t)$

(2) If $w(t)=e^{-2t}$, find its Fourier transform, then find X(f) that satisfies the following relationships:

(a) $x(t)=w(2t+2)$

(b) $x(t)=e^{-jt}w(t-1)$

(c) $x(t)=\frac{d^2w(t)}{dt^2}$