ME307 - Exam II Review Topics

SEE "How To Do Well" 1st

reading assignments covered: Chapters 4, 5, 7, 8, 9 (9.1-9.2 only)
(see the syllabus for section details)

LOOK @ SECOND (2nd)

1. microcontrollers and the PIC
   a. μP and μC architecture and terminology
      i. bus
      ii. CPU, ALU
      iii. RAM, ROM, EPROM, EEPROM
   b. PicBasic Pro
      i. For...Next, Gosub...Return, Goto, High, If...Then...Else, Input, Low, Output, Pause, Pot, While...Wend
      ii. PORTA, PORTB, TRISA, TRISB
      iii. variable types (BIT, BYTE, WORD)
      iv. binary (%), hex ($)
      v. bit access (register.bit)
      vi. integer arithmetic, roundoff, overflow
   c. design procedure
      i. flowcharts
   d. interfacing
      i. switches and buttons
      ii. LEDs and displays
      iii. transistors
      iv. open-collector ~~input~~ output or open-drain (e.g., comparator) RA4 on PIC16F84
2. system response
   a. frequency response
      i. amplitude ratio
      ii. phase angle
      iii. cutoff frequency
      iv. bandwidth
      v. attenuation
   b. Fourier series, spectrum
      i. period
      ii. fundamental frequency
      iii. harmonics
   c. measurement system characteristics
      i. amplitude linearity
      ii. adequate bandwidth
      iii. phase linearity, time displacement
   d. 0th, 1st, and 2nd order systems
      i. sensitivity
      ii. time constant
      iii. RC circuit, low-pass filter
      iv. natural frequency
      v. damping ratio, underdamped, critically damped, overdamped
      vi. resonance
3. modeling analogies

1b iii + vi

X Var BYTE
Y Var BYTE
Z Var BYTE

BYTES X, Y, Z

X = 150 Z = 2

Y = X/15*Z ⇒ Y = 60

Y = Z/15*X ⇒ Y = 0

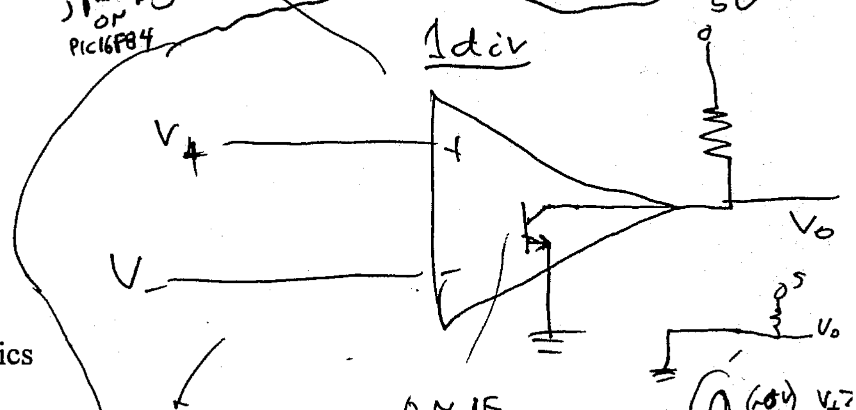
1biv

$\%10010110 = 150 = \$96$

1bi

ex:
```
J = 0
For I = 1 to 10
  If (I/5 > 0) Then
    J = J+1
  End If
Next I
```
J = ? 6

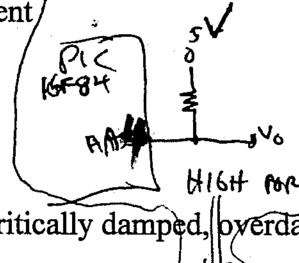
I	I/5	J
–	–	0
1	0	0
2	0	0
3	0	0
4	0	0
5	1	1
6	1	2
7	1	3
8	1	4
9	1	5
10	2	6



ON IF $V_+ > V_-$

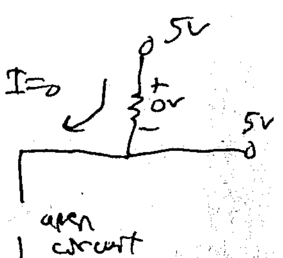
$V_o = \begin{cases} 0 \; (0V) & V_+ > V_- \\ 1 \; (5V) & V_+ < V_- \end{cases}$

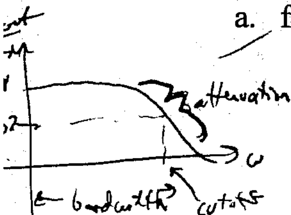
SAME



HIGH PORTA.4 ⇒ $V_o = 0$

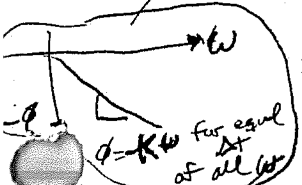
transistor on

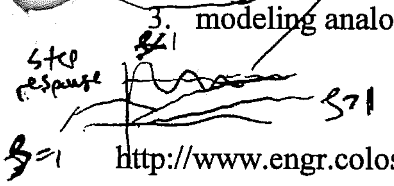


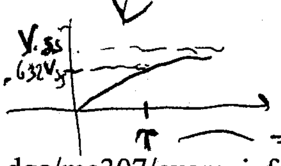


T

$\omega_0 = \frac{2\pi}{T}$







τ = RC for RC circuit

   a. flow, effort, resistance, capacitance, inertia
   b. relating (deriving) analogous physical parameters
   c. creating analogies between mechanical and electrical systems } Book + CLASS EXAMP's (BOTH DIRS) + HMWK
4. operational amplifier
   a. terminology (inverting input, noninverting input, feedback, etc.)
   b. assumptions — $V_+ = V_-$, $I_+ = I_- = 0$
   c. circuit analysis
   d. applications
      i. inverting amp
      ii. noninverting amp
      iii. integrator

      don't need to "memorize" circuits } just know how to analyze
   e. characteristics of real op amps
      i. frequency response
      ii. fall-off frequency
      iii. maximum output voltage
      iv. maximum output current

      NOT I
5. data acquisition
   a. Shannon's Sampling Theorem — $f_s > 2f_{max}$
   b. aliasing

      SPECTRUM f_{max}

      ⇒ no "aliasing": FALSE FREQUENCY
   c. A/D conversion
      i. resolution
      ii. quantization size
      iii. ~~flash converter~~ → go thru if skipped before

      F 8.11

      IN WEEK 10
   d. D/A conversion
6. position measurement
   a. switches
      i. pole, throw, NO, NC
   b. potentiometer
   c. LVDT
      i. demodulation
      ii. filtering
   d. digital encoders
      i. absolute vs. relative
      ii. gray vs. binary
      iii. quadrature decoding — SEE F9.18 FROM PREVIOUS CLASS (IF SKIPPED)
7. miscellaneous
   a. difficulties ~~form~~ fro Exam I
   b. reading assignments
   c. homework assignments
   d. Lab exercises

SEE "HOW TO DO WELL" AGAIN