**Eta Kappa Nu**

# Electrical Engineering Honor Society

**Initiation Test 2017**

Due by April 17, 2017

Submission options:

(a) Scan answer sheet and email: [Matthew.Valenti@mail.wvu.edu](mailto:Matthew.Valenti@mail.wvu.edu) or David.Graham@mail.wvu.edu

(b) Bring to Dr. Valenti’s office: AER 361 or Dr. Graham’s office: AER 355 (leave under door if nobody there)

**Turn in just the answer sheet (last page of the test)**

1. West Virginia University’s chapter of Eta Kappa Nu is the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ chapter.
2. Eta Kappa Nu was founded by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in the year of \_\_\_\_\_\_\_\_\_.
3. Eta Kappa Nu's symbol is the:
   1. The Wheatstone Bridge
   2. The Capacitance Bridge
   3. The Bent
   4. The P-N Junction.
4. Dr. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is the Eta Kappa Nu faculty advisor.
5. Eta Kappa Nu is a(n) \_\_\_\_\_\_\_\_\_\_\_\_\_ Honor Society for Electrical and Computer Engineers.
   1. West Virginia University
   2. National
   3. International
   4. Universal
6. Match the 2015 - 2016 officers with their respective position:

\_\_\_\_ President a. Catherine O’Hearn

\_\_\_\_ Vice President b. Katherine Warner

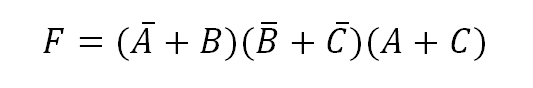
\_\_\_\_ Bridge Correspondent c. Kyle Smith

\_\_\_\_ Corresponding Secretary d. Benjamin Upton

\_\_\_\_ Recording Secretary e. Ivy Kwan

\_\_\_\_ Treasurer f. Mary Donovan

1. Write the decimal number 6831 in
   1. Base 2
   2. Base 8
   3. Base 16
2. What is the average power dissipated by an electric heater with a resistance of 50 Ω drawing a current of 30sin(30t) A?
   1. 0 kW
   2. 10 kW
   3. 14.14 kW
   4. 22.5 kW
3. Write one line of code to implement each of the following in MATLAB (no loops or semicolons allowed):
   1. Sum all odd integers from 1 to 100 **without** using the sum function.
   2. Create the following matrix  
       1 2 3 4 5 6 7 8 9 10  
       2 4 6 8 10 12 14 16 18 20  
       3 6 9 12 15 18 21 24 27 30  
       4 8 12 16 20 24 28 32 36 40  
       5 10 15 20 25 30 35 40 45 50  
       6 12 18 24 30 36 42 48 54 60  
       7 14 21 28 35 42 49 56 63 70  
       8 16 24 32 40 48 56 64 72 80  
       9 18 27 36 45 54 63 72 81 90  
       10 20 30 40 50 60 70 80 90 100
   3. Sum of all numbers from 1 to 100 that aren’t divisible by 5
4. Express the following function as a sum of products:



Pick from among the following multiple-choice answers

a)

b)

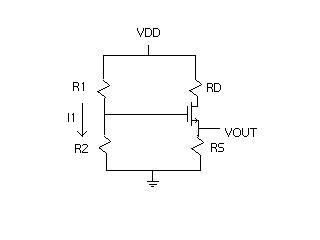
c)

d)

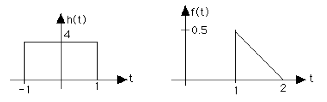
1. A second order, continuous-time system is defined by the following transfer function:

If the system receives a step input, what is the steady state output, ?

1. 0
2. 1
3. 5
4. ∞
5. For the circuit below, VDD = 10V and VOUT = 2V. Assume the transistor is in saturation, VTN = 1.2V, VDSQ = 5V, and VGS ≈ ID\*RS. The current across the bias resistors (I1) is equal to 0.05\*ID, and R1 || R2 = 96. Find R1, R2, RD, and RS.

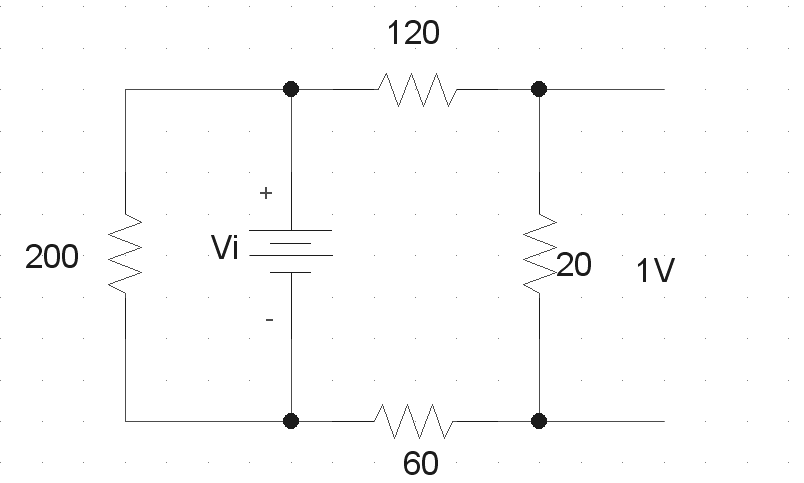


1. For h(t) and f(t) sketched below, the convolution y(t) = h(t)\*f(t) has y(1) = :

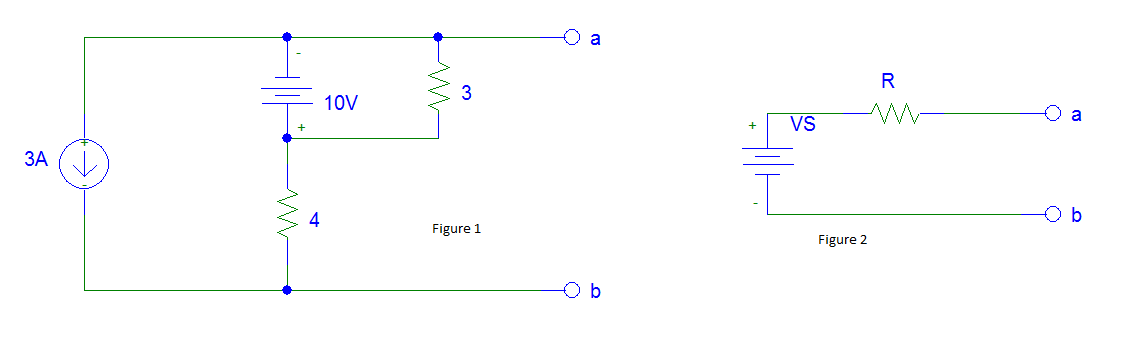


* + 1. 1
    2. 2
    3. 3
    4. 4
    5. 0.5
    6. 0
    7. 0.25
    8. None of the above

1. Forthe circuit below, find Vi.



1. The elements in **Figure 1** and **Figure 2** are linear and the sources are DC. As seen by terminals **a** and **b,** the circuit in **Figure 1** can be equivalently represented by the circuit in **Figure 2** with VS(V) and R(Ω) values as follows:



**VS R**

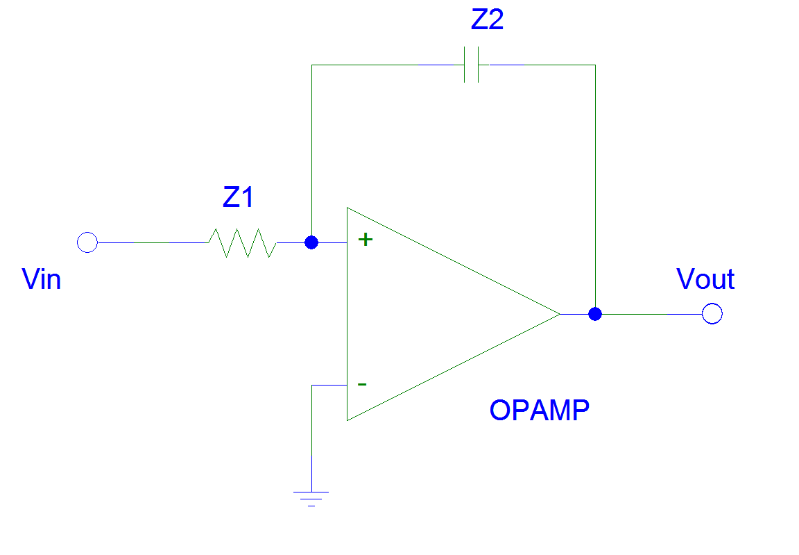
1. -22 4
2. -22 7
3. -21 7
4. -21 4
5. Three impedances of 4+j3Ω are ∆-connected and tied to a three-phase 208-V power line. What are the phase current, line current, and power factor?

|  |  |  |  |
| --- | --- | --- | --- |
|  | IΦ | IL | PF |
| a. | 24.0 A | 41.6 A | 0.8 lagging |
| b. | 41.6 A | 41.6 A | 0.8 leading |
| c. | 41.6 A | 72.1 A | 0.8 lagging |
| d. | 72.1 A | 72.1 A | 0.8 leading |

1. Design a high-pass RC filter with a corner frequency of 10 kHZ.
2. Magnetic flux density, B, and magnetic field strength, H, may experience changes at the interface of materials whose magnetic properties differ from one another. Consider the following:
3. magnitude of **B**
4. normal component of **B**
5. tangential component of **B**
6. magnitude of **H**
7. normal component of **H**
8. tangential component of **H**

What combination represents the properties of an electromagnetic wave that are continuous (i.e, do not change) across such an interface?

1. i and ii
2. ii and vi
3. iii and v
4. iv and vi
5. For the circuit shown, assume Z1 = 20kΩ and Z2 = -j80kΩ. Vout is most nearly:



1. 4∠-90° Vin
2. 4∠90° Vin
3. (1-j4) Vin
4. (1+j4) Vin
5. When a CPU fetches an instruction word from memory, the word contains an operation code that indicates the type of operation the CPU is to perform. A computer may use various addressing modes to specify the operand location. One such addressing mode is illustrated below, where R designates some register within the CPU and d is a constant embedded in the instruction word.

INSTRUCTION WORD OP CODE R d

OPERAND ADDRESS:

∑

R:

Which of the following terms best describes the addressing mode used by the instruction above?

* 1. Immediate addressing
  2. Direct addressing
  3. Indexed addressing
  4. Indirect addressing

**Answer Sheet:** Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_
3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
6. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(sort the letters a through f in the proper order)

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

8. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

9.

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
6. R1= \_\_\_\_\_\_\_\_

R2=\_\_\_\_\_\_\_\_\_\_

RD=\_\_\_\_\_\_\_\_\_\_\_

RS=\_\_\_\_\_\_\_\_\_\_\_

1. X(f)=\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Draw your sketch to the right 🡪

1. Vi=\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. Draw your circuit diagram here:
5. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
6. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
7. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_