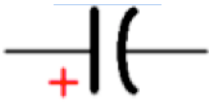
Semester 1 Final (Unit 1.1-2.4)

Multiple Choice: Circle the choice that best answers the question.

1. What tool is used to measure multiple electrical related values?
    a. Ammeter
    b. Ampmeter
    c. Digital Multi-Meter
    d. Voltmeter
2. Capacitors are used to
    a. Add resistance to a circuit
    b. Determine voltage level
    c. Store electrical charge
    d. Cap current levels
3. Which is NOT a type of capacitor
    a. Ceramic
    b. Electrolytic
    c. Mylar
    d. Plastic
4. What does LED stand for
    a. Light electric display
    b. Light emitting diode
    c. Large enhanced display
    d. Large electric display
5. Which is NOT a type of integrated circuit package
    a. BGCC
    b. DIP
    c. PLCC
    d. SOIC
6. A resistor value with colors (Red, Blue, Green, Gold) is
    a. 265 +/-5%
    b. 26k +/-5%
    c. 260k +/-5%
    d. 2.6M +/- 5%
7. What does the following schematic represent



    a. Battery
    b. Ceramic Capacitor
    c. Carbon Resistor
    d. Electrolytic Capacitor
8. What does the following schematic represent

    a. Battery
    b. Ceramic Capacitor
    c. Resistor
    d. LED
9. Resistance is measured in units of
    a. Amps
    b. Farads
    c. Ohms
    d. Volts
10. What is the following object?

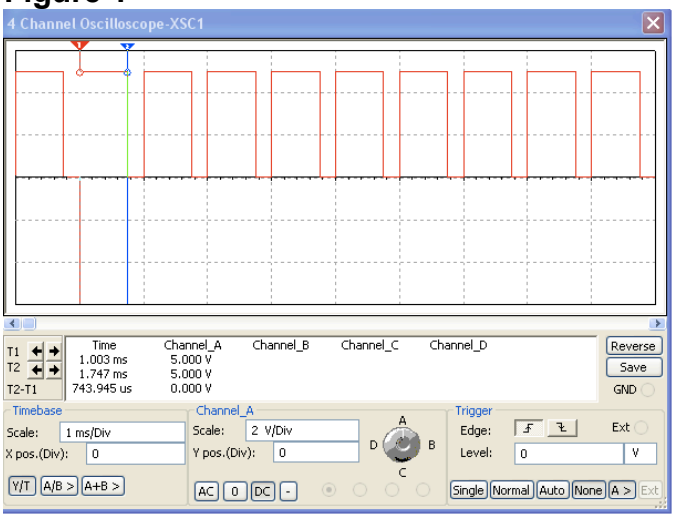
    a. Battery
    b. Capacitor
    c. Resistor
    d. LED
11. What type of capacitor is shown below

    a. Ceramic
    b. Axial Electrolytic
    c. Radial Electrolytic
    d. Mylar

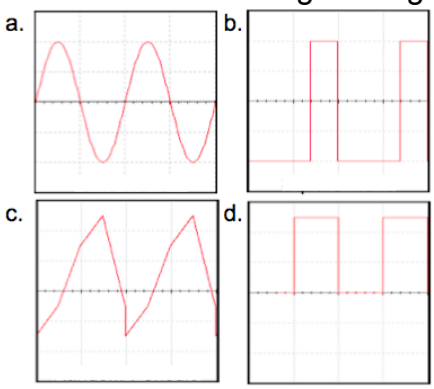
12. What is the value of the capacitor shown below

    a. 252 pf +/- 10%
    b. 252 f -20%, +50%
    c. 2500 f+/-10%
    d. 2500 pf -20%, +50%
13. When working with electricity or electrical components you should
    a. Keep areas clear of liquids
    b. Not wear jewelry
    c. Assume all circuits are on
    d. Label damaged equipment
    e. All of the above
14. Which type of fire extinguisher should you NOT use when working with electronics?
    a. Type A
    b. Type B
    c. Type C
    d. Type D
15. At what threshold does current become deadly?
    a. 10 A
    b. 1 A
    c. 100 mA
    d. 1 mA
16. The following element in solder can be dangerous to your health.
    a. Tin
    b. Copper
    c. Lead
    d. Silver
17. To remove excess solder off of the soldering iron you should
    a. Tap the soldering iron in the table
    b. Rub it off with your hand
    c. Wipe it off on a wet sponge
    d. Wipe it off on yours shirt
18. Which of the following is in scientific notation
    a. 112,000
    b. $1.0006*10^{-2}$
    c. $564*10^{3}$
    d. 127
19. Pico means
    a. 10^{-3}
    b. 10^{-6}
    c. 10^{-9}
    d. 10^{-12}
20. 650 MΩ is equal to
    a. $6.50*10^{-6}$ Ω
    b. $650*10^{-6}$ Ω
    c. $6.50*10^{6}$ Ω
    d. $650*10^{6}$ Ω
21. 35mV is equal to
    a. $3.5*10^{-3}$ V
    b. $35*10^{-3}$ V
    c. $3.5*10^{3}$ V
    d. $35*10^{3}$ V
22. If you have a 6v battery and a 300Ω resistor what current would flow through the circuit?
    a. 20 mA
    b. 50 A
    c. 294 A
    d. 306 A
    e. 1800 A
23. If you have a 100Ω, 200Ω and 200Ω resistor in parallel the total resistance is
    a. 0 Ω
    b. 50 Ω
    c. 167 Ω
    d. 500 Ω
24. If you have a 100Ω, 200Ω and 200Ω resistor in series the total resistance is
    a. 0 Ω
    b. 50 Ω
    c. 167 Ω
    d. 500 Ω

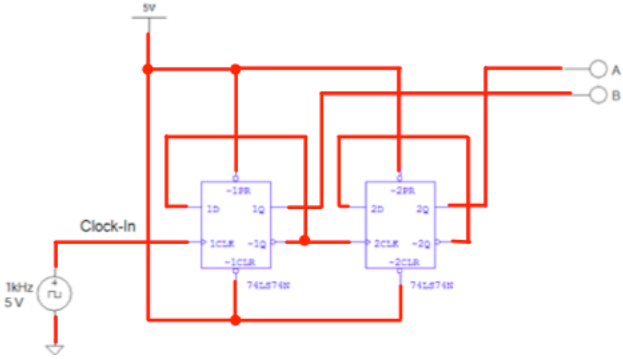
Figure 1



25. What is the amplitude
    a. 2 v
    b. .2 ms
    c. 5 v
    d. 1 ms
26. What is the period of the wave
    a. 1V
    b. 1ms
    c. 5V
    d. 5ms
27. What is the t_H
    a. .75 ms
    b. 1.00 ms
    c. 1.5 ms
    d. 1.75 ms
28. What is the Duty Cycle?
    a. 25%
    b. 50%
    c. 75%
    d. None of the above
29. You set up a 555 timer with R_A=10kΩ R_B=15kΩ and C=260uF. What is the Duty Cycle?
    a. 1.7%
    b. 2.6%
    c. 62.5%
    d. 66.7%
30. Which is not a subatomic particle?
    a. Proton
    b. Neutron
    c. Electron
    d. Potassium
31. Which element is not a good conductor
    a. Gold
    b. Silver
    c. Copper
    d. Phosphorus
32. Which of the following is a digital wave

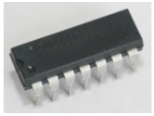


33. The main difference between combinational and sequential logic is
    a. Combinational requires a memory component
    b. Sequential requires a memory component
    c. Combinational has more than one input
    d. Sequential has more than one input
34. The circuit below is an example of a



    a. 2-bit binary counter
    b. Divide by two
    c. Both a and b
    d. None of the above
35. This type of gate outputs a “1” when the input is “0”
    a. INVERT
    b. AND
    c. OR
    d. NOR

36. This type of gate outputs a “1” only when both inputs are a “0”
    a. INVERT
    b. AND
    c. NOR
    d. NAND
37. This type of gate outputs a “0” When the inputs are “0” and “0”
    a. INVERT
    b. XOR
    c. NOR
    d. NAND
38. This type of gate outputs a “1” when only one input is a “1”
    a. OR
    b. NOR
    c. XNOR
    d. XOR
39. This type of gate outputs a “1” when both inputs are the same
    a. AND
    b. NAND
    c. XOR
    d. XNOR
40. This type of gate outputs a “1” when both inputs are a “1”
    a. AND
    b. NAND
    c. NOR
    d. INVERT
41. This type of gate outputs a “1” when any of the inputs are a “1”
    a. INVERT
    b. AND
    c. OR
    d. XOR
42. This type of gate outputs a “1” if any inputs are a “0”
    a. NAND
    b. NOR
    c. XOR
    d. XNOR
43. Rank the following from most gates found in an integrated circuit to least gates
    a. MSI>SSI>ULSI>GSI
    b. GSI>ULSI>MSI>SSI
    c. ULSI>GSI>SSI>MSI
    d. SSI>MSI>GSI>ULSI
44. The 74LS08N IC we used in class is an example of
    a. GSI
    b. LSI
    c. MSI
    d. SSI
45. What type of package is the following image



    a. DIP
    b. PLCC
    c. QFP
    d. SOIC
46. What type of package is the following image

    a. DIP
    b. PLCC
    c. QFP
    d. SOIC
47. Given the part number DM74ALS08N which segment tells you the manufacturer
    a. DM
    b. 74
    c. ALS
    d. 08
    e. N
48. Given the part number DM74ALS08N which segment tells you the package style
    a. DM
    b. 74
    c. ALS
    d. 08
    e. N

49. Given the part number DM74ALS08N which segment tells you the TTL type
    a. DM
    b. 74
    c. ALS
    d. 08
    e. N
50. Given the part number DM74ALS08N which segment tells you the logic function
    a. DM
    b. 74
    c. ALS
    d. 08
    e. N
51. Given the part number DM74ALS08N "ALS" means
    a. Automated low-power shottky
    b. Advanced low-power shottky
    c. American League Division Series
    d. Advanced Logic Series
    e. None of the above

Figure 2

Symbol	Parameter	Min	Nom	Max	Units
V_{CC}	Supply Voltage	4.75	5	5.25	V
V_{IH}	HIGH Level Input Voltage	2			V
V_{IL}	LOW Level Input Voltage			0.8	V
I_{OH}	HIGH Level Output Current			−0.4	mA
I_{OL}	LOW Level Output Current			8	mA
T_A	Free Air Operating Temperature	0		70	°C

52. Using Figure 2 what is the maximum voltage the IC can handle?
    a. 0 v
    b. .8 v
    c. 5.25 v
    d. Not enough information
53. In Figure 2 what is the lowest temperature the IC will function properly at?
    a. 0ºC
    b. 70ºC
    c. -.4mA
    d. 4.75v

Figure 3

Switching Characteristics

at V_{CC} = 5V and T_A = 25°C

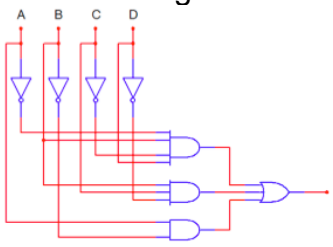
Symbol	Parameter	R_L = 2 kΩ				Units
		C_L = 15 pF		C_L = 50 pF		
		Min	Max	Min	Max	
t_{PLH}	Propagation Delay Time LOW-to-HIGH Level Output	4	13	6	18	ns
t_{PHL}	Propagation Delay Time HIGH-to-LOW Level Output	3	11	5	18	ns

54. In Figure 3 what is the minimum high to low propagation delay time using a 50pF capacitor
    a. 3 ns
    b. 4 ns
    c. 5 ns
    d. 6 ns
55. What is 29_{10} in binary?
    a. 01000_2
    b. 10111_2
    c. 11101_2
    d. None of the above
56. What is 29_{10} in octal-decimal?
    a. 35_8
    b. 53_8
    c. $3\ 101_8$
    d. $101\ 3_8$
57. What is 29_{10} in hexadecimal?
    a. $C1_H$
    b. $1C_H$
    c. 13_H
    d. 113_H
58. What is 11111_2 in base 10?
    a. 11111_{10}
    b. 31_{10}
    c. 62_{10}
    d. 63_{10}
59. What is 11011_2 in octal-decimal?
    a. 27_8
    b. 33_8
    c. $B1_8$
    d. $1B_8$
60. What is 110111_2 in hexadecimal?
    a. 27_H
    b. 33_H
    c. 37_H
    d. $B7_H$

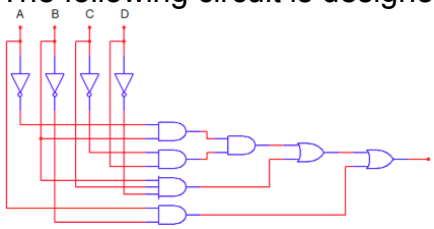
Figure 4

X	Y	Z	F_3
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	0
1	1	1	0

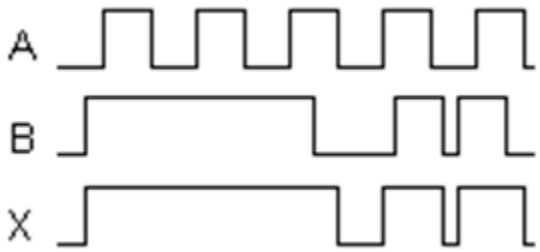
61. Which is NOT a min-term for Figure 4
    a. 001
    b. 011
    c. 101
    d. All of the above
    e. None of the above
62. Which is NOT a min-term for Figure 4
    a. $\overline{X}YZ$
    b. $X\overline{Y}Z$
    c. XYZ
    d. All of the above
    e. None of the above
63. F_4 is written in
    $F_4 = (W + \overline{X} + \overline{Y} + Z)(\overline{W} + X + \overline{Y})(W + \overline{Z})$
    a. SPO logic
    b. POS logic
    c. SOP logic
    d. PSO logic
64. F_2 is written in
    $F_2 = \overline{A}\,B\,\overline{C}\,D + B\,C\,\overline{D} + A\,\overline{B}$
    a. SPO logic
    b. POS logic
    c. SOP logic
    d. PSO logic
65. The following circuit is designed in



    a. SPO logic
    b. POS logic
    c. SOP logic
    d. PSO logic
66. The following circuit is designed in

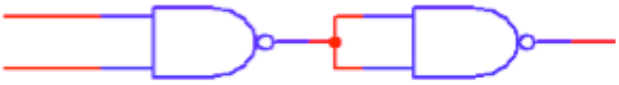


    a. SPO logic
    b. POS logic
    c. SOP logic
    d. PSO logic
67. The following waveform patter with A and B are inputs, X is the output, is for a(n)



    a. 2-input AND gate
    b. 2-input OR gate
    c. 2-input XOR gate
    d. 2-input XNOR gate
    e. 2-input NAND gate
68. The equivalent to the following diagram is

    a. AND
    b. OR
    c. INVERT
    d. None of the above
69. The equivalent to the following diagram is



    a. AND
    b. OR
    c. INVERT
    d. None of the above

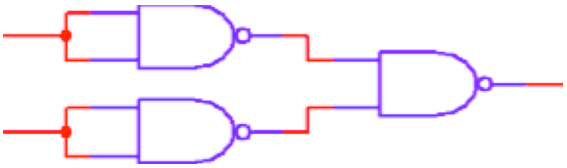
70. The equivalent to the following diagram is

a. AND
b. OR
c. INVERT
d. None of the above

71. The equivalent to the following diagram is

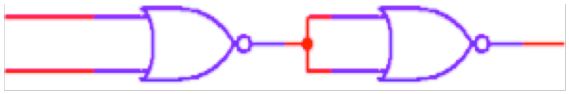
a. AND
b. OR
c. INVERT
d. None of the above

72. The equivalent to the following diagram is



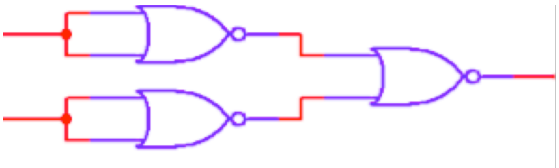
a. AND
b. OR
c. INVERT
d. None of the above

73. The equivalent to the following diagram is



a. AND
b. OR
c. INVERT
d. None of the above

74. The equivalent to the following diagram is



a. AND
b. OR
c. INVERT
d. None of the above

75. Which segments are not turned on for a seven segment display showing

a. a and b
b. a and d
c. b and e
d. c and f

76. What is the top of the following common cathode display connected to?

a. Ground
b. VCC
c. Resistor
d. None of the above

77. Solve the following binary addition problem

$$\begin{array}{r} 01001_2 \\ +\ 00011_2 \\ \hline \end{array}$$

a. 01000
b. 01100
c. 01110
d. 01111

78. Solve the following binary addition problem

$$\begin{array}{r} 01011_2 \\ +\ 00011_2 \\ \hline \end{array}$$

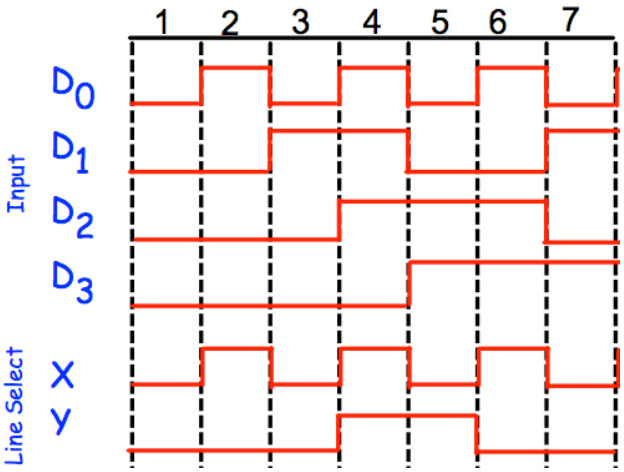
a. 01000_2
b. 01100_2
c. 01110_2
d. 01111_2

79. What is the two's compliment of (-7) in 4-bit binary?
    a. 0111_2
    b. 1000_2
    c. 1001_2
    d. 1100_2
80. In two's compliment 8-bit binary what is the largest positive value?
    a. 127_{10}
    b. 128_{10}
    c. 255_{10}
    d. 256_{10}
81. In two's compliment 8-bit binary what is the largest negative value?
    a. -127_{10}
    b. -128_{10}
    c. -255_{10}
    d. -256_{10}
82. In two's compliment 8-bit binary what is the answer to

$$\begin{array}{r} 01001011_2 \\ +\ 11100011_2 \\ \hline \end{array}$$

    a. 100101110_2
    b. 00101110_2
    c. 100101100_2
    d. 00101010_2

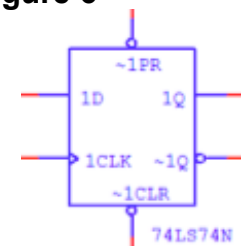
Figure 5



83. Figure 5 is showing the Input and Line Select for a
    a. Multiplexer
    b. De-multiplexer
    c. Divide by two circuit
    d. RC circuit

84. In Figure 5 the output at point 3 is equal to
    a. D_0
    b. D_1
    c. D_2
    d. D_3
85. In Figure 5 the output at point 5 is equal to
    a. D_0
    b. D_1
    c. D_2
    d. D_3
86. A De-multiplexer function is to manage
    a. 1 input into multiple outputs
    b. Multiple inputs into 1 output
    c. Count in binary
    d. None of the above
87. A Multiplexer function is to manage
    a. 1 input into multiple outputs
    b. Multiple inputs into 1 output
    c. Count in binary
    d. None of the above

Figure 6



88. What is the component in Figure 6
    a. D Flip-Flop
    b. De-Multiplexer
    c. Multiplexer
    d. Resistor Pack
89. If a low input is put into the Preset of Figure 6 the Q is
    a. Depends on the input
    b. Depends on the previous output
    c. Always 1
    d. Always 0
90. If a low input is put into the Clear of Figure 6 Flop the Q is
    a. Depends on the input
    b. Depends on the previous output
    c. Always 1
    d. Always 0

Free Response

1. Create a divide by 2 circuit connected to a second divide by two circuit using D-Flip Flops. (4pts)

1. Use a K-Map to determine the simplest expression given the following truth table. (3pts)

X	Y	Z	F_2
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	X
1	0	0	0
1	0	1	0
1	1	0	1
1	1	1	X

2. Create a truth table for $F_3 = X + YZ + \overline{X}\overline{Y}\overline{Z}$ (2pts)

X	Y	Z	F_3
0	0	0	
0	0	1	
0	1	0	
0	1	1	
1	0	0	
1	0	1	
1	1	0	
1	1	1	

3. Show step by step the Boolean simplification for $F_4 = WWX + \overline{W + Z} + Y\overline{Y}Z + \overline{\overline{X}\overline{Y}}\overline{Z}$ (4pts)

4. Your teacher keeps their finals in their office that is protected by an alarm that goes off if, the door is opened without a key or if the window is opened.

   Key: 1= key used/0=key not used
   Door: 1=door closed/0=door open
   Window: 1=window closed/0=window open

   a. Create a Truth Table (4pts)
   b. Create a K-map (3pts)
   c. Derive the simplest logic expression (2pts)
   d. Implement the circuit with NAND gates (3pts)

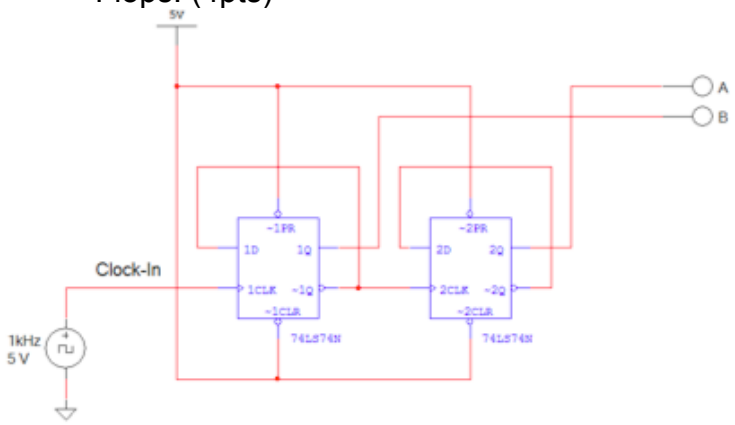
Answer Key

MC

1. C
2. C
3. D
4. B
5. A
6. D
7. D
8. C
9. C
10. C
11. C
12. D
13. E
14. A
15. C
16. C
17. C
18. B
19. D
20. D
21. B
22. A
23. B
24. D
25. C
26. B
27. A
28. C
29. C
30. D
31. D
32. D
33. B
34. C
35. A
36. B
37. B
38. D
39. D
40. A
41. C
42. B
43. B
44. D
45. A
46. D
47. A
48. E
49. B
50. D
51. B
52. C
53. B
54. B
55. C
56. A
57. A
58. B
59. B
60. C
61. E
62. C
63. B
64. C
65. C
66. B
67. B
68. C
69. A
70. C
71. D
72. B
73. B
74. A
75. B
76. A
77. B
78. C
79. C
80. A
81. B
82. B
83. A
84. A
85. B
86. A
87. B
88. A
89. C
90. D

Free Response

2. Create a divide by 2 circuit connected to a second divide by two circuit using D-Flip Flops. (4pts)



3. Use a K-Map to determine the simplest expression given the following truth table. (3pts)

X	Y	Z	F_2
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	X
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	X

F_2=XY+Z

	$\overline{Z}$	Z
$\overline{X}\overline{Y}$	0 0	1 1
$\overline{X}Y$	0 2	X 3
XY	1 6	X 7
$X\overline{Y}$	0 4	1 5

4. Create a truth table for $F_3 = X + YZ + \overline{X}\overline{Y}\overline{Z}$ (2pts)

X	Y	Z	F_3
0	0	0	1
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	1

5. Show step by step the Boolean simplification for $F_4 = WWX + \overline{W + Z} + Y\overline{Y}Z + \overline{\overline{X}\overline{Y}Z}$ (4pts)

$F_4 = WX + \overline{W + Z} + Y\overline{Y}Z + \overline{\overline{X}\overline{Y}Z}$

$F_4 = WX + \overline{W}\,\overline{Z} + Y\overline{Y}Z + \overline{\overline{X}\overline{Y}Z}$

$F_4 = WX + \overline{W}\,\overline{Z} + 0Z + \overline{\overline{X}\overline{Y}Z}$

$F_4 = WX + \overline{W}\,\overline{Z} + 0 + \overline{\overline{X}\overline{Y}Z}$

$F_4 = WX + \overline{W}\,\overline{Z} + 0 + (\overline{\overline{X}} + \overline{\overline{Y}})\overline{Z}$

$F_4 = WX + \overline{W}\,\overline{Z} + 0 + (X + Y)\overline{Z}$

$F_4 = WX + \overline{W}\,\overline{Z} + 0 + X\overline{Z} + Y\overline{Z}$

$F_4 = WX + \overline{W}\,\overline{Z} + X\overline{Z} + Y\overline{Z}$

6. Your teacher keeps their finals in their office that is protected by an alarm that goes off if, the door is opened without a key or if the window is opened.

   Key: 1= key used/0=key not used
   Door: 1=door closed/0=door open
   Window: 1=window closed/0=window open

   e. Create a Truth Table (4pts)
   f. Create a K-map (3pts)
   g. Derive the simplest logic expression (2pts)
   h. Implement the circuit with NAND gates (3pts)

K	D	W	F_A
0	0	0	1
0	0	1	1
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	0

	$\overline{W}$	W
$\overline{K}\,\overline{D}$	1 0	1 1
$\overline{K}D$	1 2	0 3
KD	1 6	0 7
$K\overline{D}$	1 4	0 5

$$F_A = \overline{K}\,\overline{D} + \overline{W}$$

Simplified NAND