**EECE 200 ID:201203616**

**Homework 1**

Problem 1:

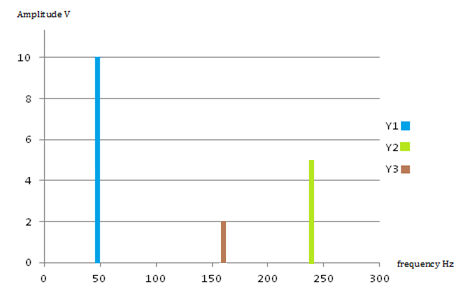
1. The amplitude of Y1 is 10V, of Y2 is 5V, of Y3 is 2V

|  |  |  |  |
| --- | --- | --- | --- |
|  | Period(T) | Frequency(F=1/T) | Angular frequency(w=2π/T) |
| Y1 | 0.021s | 47.62Hz | 299.21rad/s |
| Y2 | 4.2E-3s | 238.1Hz | 1496.03rad/s |
| Y3 | 6.25E-3s | 160Hz | 1005.31rad/s |

c-Y2 has the highest frequency.

d- Y1 is offset 0 cycle with respect to time 0, hence θ1=0°=0 rad. Y2 is offset ¼ cycle with respect to time 0, θ2=1/4\*360=90°=90\*(2π/360)= π/2 rad. Y3 is offset ½ cycle with respect to time 0, θ3=1/2\*360=180°=180\*(2π/360)= π rad.

Y1(0)=10\*sin(0)=0V, and from the graph Y1 at 0s is equal to 0; Y2(0)=5\*sin(π/2)=5V and from the graph Y2 at 0s is equal to 5V, Y3(0)=2\*sin(π)=0V and from the graph Y3 at 0s is equal to 0V.

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Problem 2:

1. NRJ 99.1 MHz, its frequency is within the FM dedicated bandwidth 88MHz-108MHz
2. Each station is assigned a 10KHz bandwidth the total bandwidth dedicated to AM radio ranges from 530 to 1700 KHz, so the number of radio stations that the AM dedicated bandwidth can afford in Lebanon is (1700-530)/10= 117 stations
3. The bandwidth of a tv station is bigger than the bandwidth of a fm station because not only voice is transmitted but also image, and image is produced by a large number of pixels, so the bandwidth of a tv station is in MHz.
4. The bandwidth of a black and white tv station is bigger than a color station because the bandwidth of a black and white tv station is found by dividing the number of pixels per seconds by 2, but for a colored tv we divided by more than 2 so we get a smaller bandwidth.

Problem 3:

1. The dimensions are 5\*5= 25 pixels
2. There are four different levels of grey so we can use 2 bits per pixel to represent them. 00 for black, 01 for dark grey, 10 for light grey, 11 for white.
3. [0 3 2 3 0  
   2 3 1 3 3  
   0 3 2 3 2  
   3 3 3 1 3  
   2 0 1 3 0]
4. If the image is composed of 25 pixels so 50 bits, and it’s a part of a movie that is playing at a rate of 30 frames per second, so 30\*50=1500 bits per second. The size of the folder if we record 2.5 minutes of the movie is going to be 1500\*(2.5\*60)=225000 bits= 28125 bytes= 0.026822 Mb

Problem 4:

1. 10011101.0111012=

(1\*2^7)+(0\*2^6)+(0\*2^5)+(1\*2^4)+(1\*2^3)+(1\*2^2)+(0\*2^1)+(1\*2^0)+(0\*2^-1)+(1\*2^-2)+(1\*2^-3)+(1\*2^-4)+(0\*2^-5)+(1\*2^-6)=128+0+0+16+8+4+0+1+0+0.25+0.125+0.0625+0+0.015625=157.45312510

1. 485.2310

|  |  |  |  |
| --- | --- | --- | --- |
| *Div* | *Quo.* | *Rem.* | *Binary number* |
| *485/2* | *242* | *1* | *1* |
| *242/2* | *121* | *0* | *01* |
| *121/2* | *60* | *1* | *101* |
| *60/2* | *30* | *0* | *0101* |
| *30/2* | *15* | *0* | *00101* |
| *15/2* | *7* | *1* | *100101* |
| *7/2* | *3* | *1* | *1100101* |
| *3/2* | *1* | *1* | *11100101* |
| *½* | *0* | *1* | *111100101* |

*0.23\*2=0.46;* *0.46\*2=0.92; 0.46\*2=0.92, 0.92\*2=1.84; 0.84\*2=1.68; 0.68\*2=1.36, 0.68\*2=1.36; 0.36\*2=1.72;0.36\*2=1.72;0.72\*2=1.44;0.44\*2=0.88;0.88\*2=1.76;0.76\*2=1.52;0.52\*2=0.04;0.04\*2=0.08;0.08\*2=0.16;0.16\*2=0.32;0.32\*2=0.64;0.64\*2=1.28;0.28\*2=0.56;0.56\*2=1.12;0.12\*2=0.24;* *0.24\*2=0.48;0.48\*2=0.96;0.96\*2=1.92*

*0.92 was repeated twice, the binary representation: 10011101.* *00111110110000010100012*

1. 1 in binary is 001, 5 is 101, 7 is 111, 4 is 100 so 15748 in binary is 0011011111002
2. Split binary numbers into group of 4 and convert each group to corresponding hexadecimal  
   1000 is 8, 1111 is F, 1 is 1 so 1000111112=8F116
3. 1 is converted into 0001, C into 1011, 8 into 1000, B into 1010 so the binary representation is 00011011100010102