Seat Number

King Mongkut's University of Technology Thonburi
Midterm Examination
Semester 1 -- Academic Year 2012

Subject: ENE 326 Electronics Communication Engineering
For: Electrical Communication and Electronic Engineering, 3rd. Yr. (Inter. program)
Exam Date: October 10th , 2012 **Time:** 1.00-4.00 pm.

Instructions:-

1. This exam consists of 7 problems with a total of 12 pages, including the cover.
2. Answer each problem on the exam papers itself.
3. KMUTT 'rule compiled calculator is allowed.
4. Do not bring any exam papers and answer sheets outside the exam room.

Remarks:-

- **Raise your hand when you finish the exam to ask for a permission to leave the exam room.**
- **Students who fail to follow the exam instruction might eventually result in a failure of the class or may receive the highest punishment with university rules.**

Exam No.	1	2	3	4	5	6	7		TOTAL
Full Score									
Graded Score									

Name _____ **Student ID** _____

Assistant Prof. Chanin Wongngamkam Tel: 9073

This examination has been approved by the committees of the ENE department.

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Name.....ID.....Class.....

Instruction

Mark "X" over the best choice in the given answer sheet (1 pt. each)

1.1 An AM wave with 150W of total power is fed into an 50 Ohms matched antenna. Calculate the power in each sideband if the modulation index is fixed at 1

a. 25 W
b. 33.3W
c. 66.6 W
d. none of above is correct

1.2. From above question, If the Modulation Index is 0.8 .Recalculate for the power in each sideband.

a. 12.12 W
b. 13.12 W
c. 15.10 W
d. 18.18 W

1.3. Calculate power that can be reduced if the ambient temperature reduce from +27 to - 243 celcius

a. 10 dB
b. 11 dB
c. 12 dB
d. none of above is correct

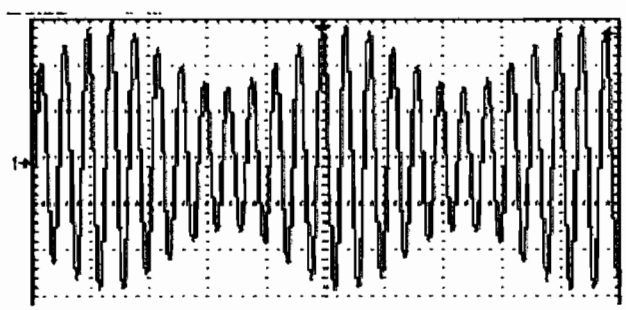
1.4. In EKG monitoring of some medical instrument. Which noise has to be concerned

a. RFI noise
b. Transit time noise
c. 1/f noise
d. none of above is correct

1.5. In the series R,L,C circuit , what is the relationship of the bandwidth to the circuit elements.

a. Bandwidth is directly related to R /L
b. Bandwidth is directly related to L/C
c. Bandwidth is inversely related to R /L
d. none of above is correct

1.6. Calculate the percentage modulation of the picture below



a. 63 %
b. 67 %
c. 70 %
d. none of above is correct

1.7. Which one is true for the adjustable crystal oscillator ?

a. series resonance
b. anti resonance
c. between series and anti resonance
d. none of above is correct.

1.8. Which one is related to the efficiency?

a. Unloaded Q
b. Loaded Q
c. Input impedance
d. Output impedance

Name.....ID.....Class.....

1.9. What type of noises is found in the HF communication ?

b. cosmic noise
b. atmospheric noise
c. shot noise
d. thermal noise

1.10.Which one is not the product of non linear circuit?

a. L.O. frequency
b. The mixed frequency of LO + RF
c. Second harmonics of the LO. Frequency measured at the mixer output.
d. Second harmonics of the RF. Frequency measured at the mixer output.

1.11.For maximum power transfer

a. source impedance and load impedance must be equal
b. source impedance must be lower than load impedance
c. source impedance must be higher than load impedance
d. non of above is correct

1.12 Which one is suitable for SSB amplifier

a. Class A
b.Class B
c.Class C
d.Class D

1.13 What happen at the resonance frequency of a series resonance circuit?

a.Z of the circuit is highest.
b. Z of the circuit is lowest.
c.Voltage across the LC has highest value.
d.None of above is correct.

1.14 What type of the oscillator is not suitable for the Local Oscillator in the broadcasting receiver?

a.Crystal oscillator
b.Colpitts oscillator
c.Clapps oscillator
d.All of above is correct

1.15 This is the benefits of having the carrier in AM radio

a. Detection in the receiver will be very easy
b. Can provide the AGC in the receiver
c. Can provide the AFC in the receiver
d. All of above is correct.

1.16.How does the phase detector in MC 145152 operate?

a. Logic comparison
b. Edges comparison
c. Positive edge comparison
d no correct answer

1.17.SSB filtering need this process

a. Balanced modulation
b. very high Q filtering
c. Low Q filter.
d. None of above is correct

1.18.Another name for the SSB detector

a. Product detector
b. Diode detector
c. Peak detector
d. RF detector

Name.....ID.....Class.....

1.19.Describe the impedance of the crystal at frequency above series resonance

a. open circuit
b. short circuit
c. inductive
d. capacitive

1.20.Crystal oscillator is very stable unless

a. induced by magnetic field
b. ambient temperature change
c. induced by electric field
d. non of above is correct

1.21 This diode need reverse bias to operate properly

a. ring diode
b. diode detector
c. varicap diode
d.rectifier diode

1.22. What is value of T_o in order to find the Equivalent noise temperature T_{eq}?

a. 273 K
b. 290K
c. 300K
d. none of above is correct

1.23. Double balanced mixer is suitable for

a. AM modulator
b. SSB modulator
c. Phase modulator
d. FM modulator

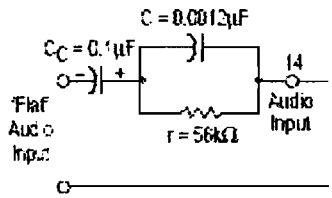
1. 24. Which one is the frequency band that is suitable for space communication ?

a .MF
b. HF
c. VHF
d. UHF

1.25. Which one is not the main made noise ?

a .Noise from the power line
b .Noise from the electrical bulb
c. Noise from the running motor
d. Noise from the thunder

1.26. What happen to the signal from this circuit ?



a. Low frequency portion will attenuate
b. high frequency portion will attenuate
c. Decreasing the noise
d .no correct answer

1.27. Calculate the m_f of the FM Broadcast transmitter with highest tone input ?

a. 3
b. 4
c. 5
d. 6

1.28. MC145152 can be used in the radio transmitter as ?

a .IF amplifier
b. mixer
c. Oscillator
d. No correct answer

Name.....ID.....Class.....

1.29. Calculate the noise voltage from 1MOhms resistor at 1MHz and 30 celcius ?

a .215 μV

b. 129.39 μV

c. 111 μV

d .No correct answer

1.30. This parameter may come from the Local Oscillator ?

a .Harmonics content

b. Spurious frequencies

c. Noises sideband

d . All of above

1.31. Calculate the noise power at 1MHz and 30 celcius ?

a .-112.8 dBm

b. -113.8dBm

c. -110.5 dBm

d .-121.6dBm

1.32. Which one is the method of noise reduction ?

a .Decrease the bandwidth

b. Decrease the temperature

c. Decrease the input impedance

d. All of above

1.33. Which one is the non linear circuit

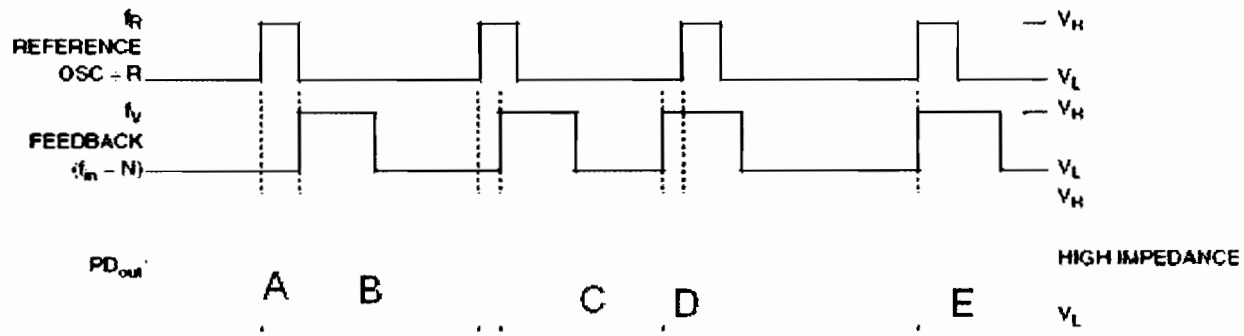
a . AM modulator

b .Pulse amplifier

c. RF amplifier

d .RF oscillator

The following figure is for Q.34 - 39



1.34. What will happen at time A ?

a. PDout gives logic 1

b. PDout gives logic 0

c. PDout remain high impedance

d. No correct answer

1.35. What will happen at time B ?

a. PDout gives logic 1

b. PDout gives logic 0

c. PDout remain high impedance

d. No correct answer

1.36. What will happen at time D?

a. PDout gives logic 1

b. PDout gives logic 0

c. PDout remain high impedance

d. No correct answer

1.37. What will happen at time E?

a. PDout gives logic 1

b. PDout gives logic 0

c. PDout remain high impedance

d. No correct answer

Name.....ID.....Class.....

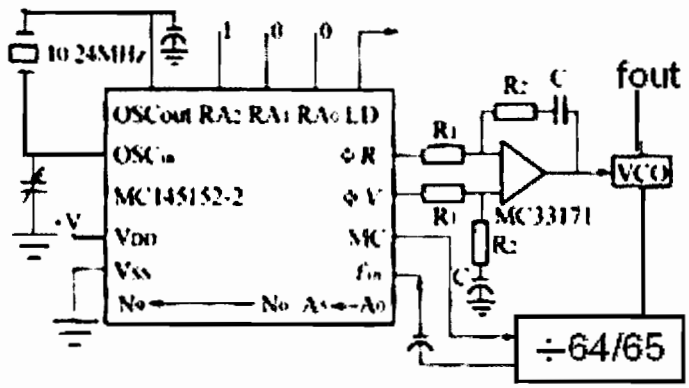
1.438. What kind of techniques used in this phase detector?

a. Logic AND
b. Analog multiplier
c. Exclusive or
d. No correct answer

1.39. Compare PDout Voltage at time B and time C

a. Voltage at time B > time C
b. Voltage at time B = time C
c. Voltage at time B < time C
d. No correct answer

Use the following diagram to answer Q.1.40 – 1.48



Reference Address Code			Total Divide Value
RA2	RA1	RA0	
0	0	0	8
0	0	1	64
0	1	0	128
0	1	1	256
1	0	0	512
1	0	1	1024
1	1	0	1160
1	1	1	2048

1.40. This circuit utilized the technique called

a. Double loop frequency synthesizer
b. Single modulus frequency synthesizer
c. Dual modulus frequency synthesizer
d. No correct answer

1.41. Calculate for N if f_{out} is 909.20 MHz

a. N = 709
b. N = 710
c. N = 711
d. No correct answer

1.42. Calculate for A if f_{out} is 909.20 MHz

a. A = 11
b. A = 41
c. A = 31
d. A = 20

1.43. From Q41, Calculate maximum output frequency when N is fixed but A can be increased

a. 909.20 MHz
b. 910.06 MHz
c. 919.00MHz
d 918.86 MHz

1.44. If the loop will lock within 3 periods of the f_{ref} What is this value ?

a. 50 microsecond
b. 150 microsecond
c. 50 millisecond
d 5 millisecond

1.45. Where is the Hi -Z point in the circuit?

a. at MC pin
b. at Op-Amp. Input pin
c. at VCO input pin
d no correct answer

Name.....ID.....Class.....

1.46. What is the purpose of the series R2+C ?

a. boost the frequency response of the loop
b. decrease the 50 Hz interference
c. decrease 20 KHz interference
d decrease 1.024 MHz interferenc

1.47. What is the total divided no. of this circuit?

a. MA+A
b. NM+A
c. M A+(N-1)
d. NA+M

1.48. What is the counting number at the beginning of the count ?

a. MA+A
b. NM+A
c. M A+(N-1)
d. NA+M

1.49. What is the characteristic only found in FM radio ?

a .single sideband
b. suppressed carrier
c. Capture effect
d. Has large carrier

1.50. Compare -100 dBm and 1 $x10^{-6}$ V_{rms} for a 50 Ohms load?

a. Can't compare different units
b. -100 dBm is bigger
c. -100 dBm is smaller
d. they are equal

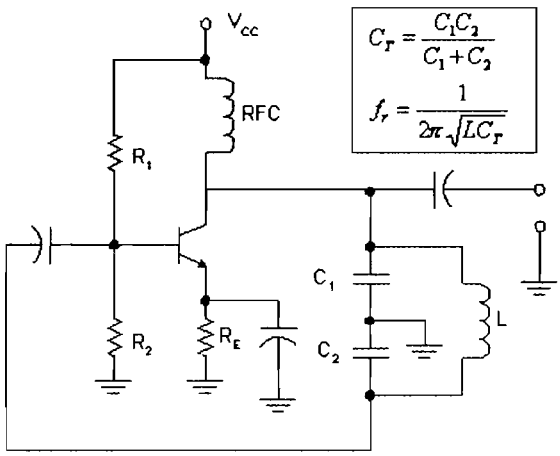
2. Draw the block diagram of an indirect FM generator (10 points)

Given the FM Armstrong`s signal = $E.\cos\omega t + E._m.\sin\mu t.\sin\omega t$

Name.....ID.....Class.....

3. Fill in the blanks or answer the question (16 points)

Use the following figure for Q2.1 – Q2.4 (2 points each)



2.1. The above circuit is called..... .....

2.2. The Function of RFC is to ....

2.3. Let C1 = c2 = 60 x10^{-12} F ,L = 0.9 x10^{-6} Henry. Calculate the output frequency .....

2.4. Design a VCO buy draw your own addition circuit into the above schematic (2 points)

2.5. Given

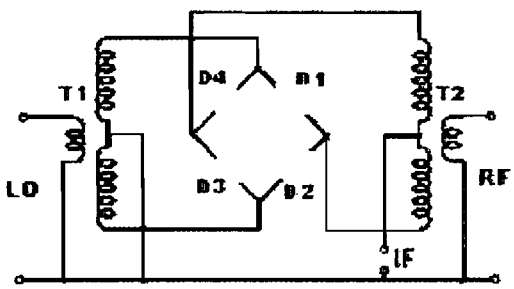
E_C is the peak voltage of the carrier before modulation

ω_C and ω_M stand for carrier frequency and modulating frequency

m_f is the modulation index for FM

Write down the Instantaneous Voltage of FM signal below (2 points)

2.6. Place the diodes in the correct polarity (2 points)



2.7.The electric field strength (rms) at a receiving station is 10μV/m. Calculate

(a) the magnetic field strength; (2 points)

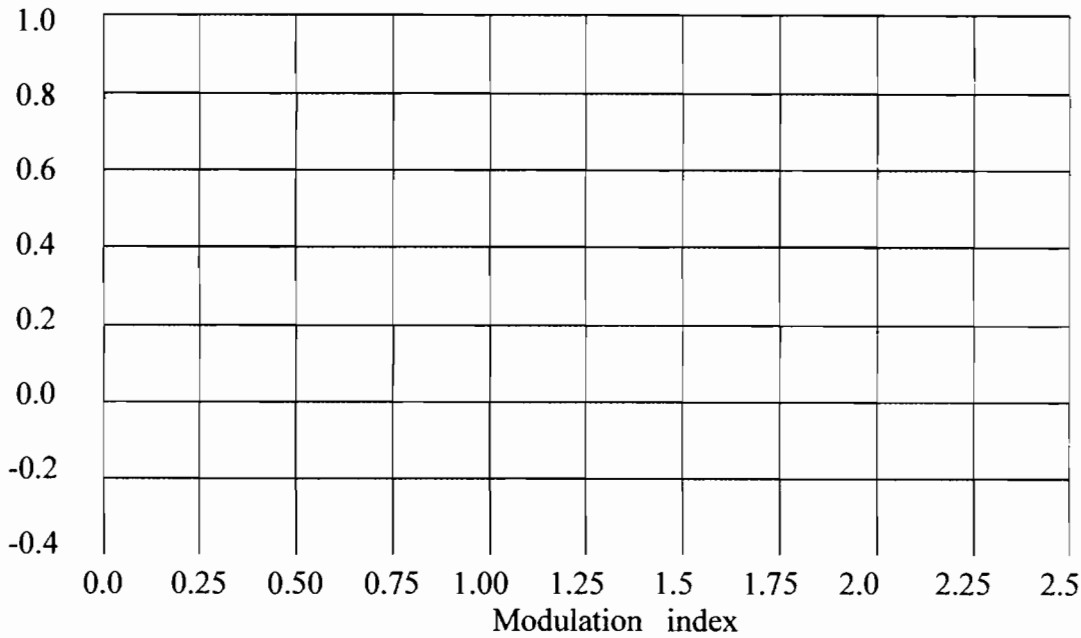
(b) the amount of power incident on a receiving aerial with an effective area of 1 m^2(2 points)

Name.....ID.....Class.....

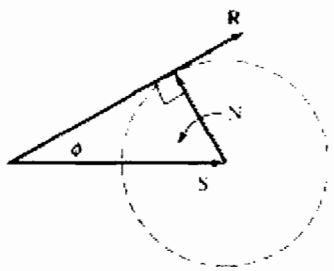
4. Plot the carrier amplitude of the Frequency modulated wave from the following data (8 points)

m_f	0.00	0.25	0.50	1.00	1.5	2.0	2.41	2.5	
J_0	1.00	0.98	0.94	0.77	0.51	0.22	0	-0.05	
$P(J_0)$									

Relatives power of J_0



5. Explain this figure (6 points)



Name.....ID.....Class.....

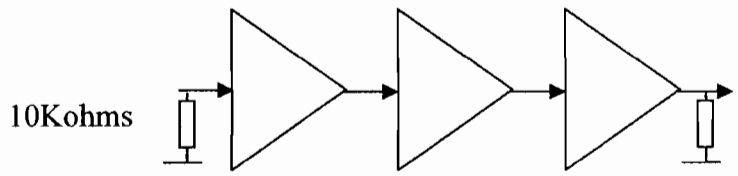
6. Fill in the blanks (10 points)

Amplifier type	Common Base	Common Emitter	Common Collector
Input/output phase relationship	0 degree		
Voltage gain		medium	
Current gain		medium	
Power gain			medium
Input resistance		medium	
Output resistance		medium	

7. From the following information

a) Calculate the noise voltage and power at the input and output of the system (5 points)

b) overall noise figure of the system (5 points)



Gain 14 dB Gain20 dB Gain20dB T 22 Celsius
NF 3dB NF 8 dB NF8 dB
BW. 314 KHz

Formulas

$$P_n = kT\Delta f$$

$$e_n = \sqrt{4kT\Delta f R}$$

$$i_n = \sqrt{2qI_{dc}\Delta f}$$

%m =(B-A/B+A) x 100% or %m = (E_i/E_c) x100%

Sin A Sin B = 1/2cos(A-B) - 1/2 cos(A+B)

Cos A Cos B = 1/2cos(A+B) - 1/2 cos(A-B)

$$m = \frac{E_s}{E_n}$$

$$e = E_c \sin \omega_c t + \frac{mE_c}{2}\cos(\omega_c - \omega_i)t - \frac{mE_c}{2}\cos(\omega_c + \omega_i)t$$

$$E_{SF} = \frac{mE_c}{2}$$

$$P_t = P_c(1 + \frac{m^2}{2})$$

$NR = NR_1 + (NR_2 - 1)/PG_1 + (NR_3 - 1)/PG_1.PG_2$ ..... noise ratio

$\Delta f = \phi_{rad} \; x \; f_m$ .....frequency deviation from noise