King Mongkut University Of Technology Thonburi

Midterm Examination   Semester 1/2015

Subject : EIE 326 Electronics Communication Engineering

Student: 3rd Yr. Electronics & Telecommunication Eng.

Date: September 28th, 2015   **Time:** 09.00-12.00AM

Instructions

1. There are 48 questions in 10 pages, total 100 points.

2. Answer all questions in this paper.

3. KMUTT approved calculator can be used.

4. Books and documents are allowed.

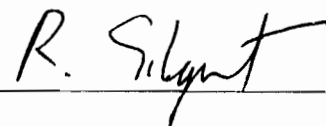5. You are not allowed to bring the question papers out of the examination room.

Notes

- When you finished, please raise your hand for the permission to leave the room.

- Any misbehave in this room may result to the highest penalty

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Name _____ Student ID_____

Assistant Prof. Chanin Wongngamkam Tel: 9070

This papers have been approved

R. Silput

(Assoc. Prof. Rardchawadee Silapunt, Ph.D.)

Head of Electronic and Telecommunication Engineering Department

Name..ID. no.................................Department.................................

Q1. Mark X over your choice in the answer sheet on page 9. (1 points each)

1. Calculate the noise power at T 300K, BW. 1MHz

   a) 0.003 pW   b) 0.004pW   c) 0.005 pW   d) 0.006 pW

2. Convert the answer from 1 of Q1 into dBm.

   a)-113.8 dBm   b) -103.8 dBm   c) -111.8 dBm   d)-115.7 dBM

3. From 1 of Q1, calculate the thermal noise voltage at the input of the receiver with 75 ohms input impedance?

   a) 1.4494 µV   b) 1.44494 µV   c) 1.41494 µV   d) 1.11499 µV

4. Noise at the input of an amplifier in operation is -100 dBm but it is -99.7 dBm at the output. Calculate the noise factor.

   a) 1.0755   b) 1.2755   c) 1.0715   d) 1.0015

5. What is the value of NF of the only one transistor in the amplifier from 4. of Q1?

   a) 1.7 dB   b) 1.2 dB   c) 0.3 dB   d) 0.7 dB

6. How can we minimize the spurious from DDS?

   a) Apply a filter at the o/p of DDS   b) Decrease the clock frequency

   c) Increase the clock frequency   d) Increase the no. of bits

7. A common base BJT amplifier is commonly used as the rf amplifier for what reason?

   a) High input impedance   b) Low input impedance

   c) High current gain   d) Wide bandwidth

8. What is the level of noise in dBm/Hz at 290K ?

   a) -178 dBm/Hz   b) -177 dBm/Hz

   c) -175 dBm/Hz   d)-174dBm/Hz

9. The frequency of the crystal oscillator can be generated at?

   a) At series resonance   b) At parallel resonance

   c) Between series resonance and anti-resonance   d) all is correct

10. What is the advantage of PFD when compare to other types of phase detector?

   a) Higher Q   b) Wider detection range

   c) More o/p voltage   d) all is correct

11. What is the benefit of the charge pumped when compare to others?

    a) Suitable for connection to the outside capacitor   b) More voltage can be obtained

    c) Voltage change is faster   d) all is correct

12. Compare the highest S/N available from the radio receiver with 12 bits ADC and 8 bits ADC?

    a) 12 bit ADC provide 24 dB more SNR than 8 bit ADC   b) SNR is always equal

    c) 12 bit ADC provide 20 dB more SNR than 8 bit ADC   d) no correct answer

13. The SFDR = 40 dB means?

    a) O/P level of the input signal is more than the spurious for 40 dB

    b) I/P level of the input signal is more than the spurious for 40 dB

    c) The input frequency is more than the spurious for 40 dB 40 dB

    d) no correct answer

14. Blocking and desensitization in the receiver may result from?

    a) Non linearity of the circuit   b) Strong interference

    c) DR is too low   d) no correct answer

15. What is the method that can convert phase modulation into frequency modulation?

    a) Frequency multiplication   b) Frequency division

    c) Frequency subtraction   d) Frequency addition

16. FM detection by IQ demodulator with the Zero crossing detection is comparable to?

    a) Differentiation   b) Synchronous detection

    c) Phase detection   d) FM to AM conversion

17. Intermediate Frequency in the super heterodyne receiver can be obtained from?

    a) Frequency multiplication   b) Frequency division

    c) Frequency subtraction   d) Frequency addition

18. Is it possible to decrease the receiver's noise floor? Reason?

    a) No, since it is the constant   b) No, only increasing is possible

    c) Yes, if we can reduce the operating frequency   d) Yes, if we can reduce the bandwidth

19. How can we solve the image frequency problem in the modern low IF radio receiver?

    a) Using the band pass filter   b) Applying the quadrature mixer

    c) DSP implementation   d) Using the ADC

20. What is the amount of NF of an amplifier with equi. noise Temp = 120K? Ref. T = 290K

    a) 1.2 dB   b) 1.3 dB

    c) 1.4 dB   d) 1.5dB

21. A radio receiver with the input impedance of 50 Ω require 1μVrms which is equal to?

    a) -107 dBm   b) -117 dBm

    c) -109 dBm   d) -119 dBm

22. A series RLC circuit (R = 200 Ω, L = 10 μH, C = 0.01μF), which statement is correct for 200 KHz?

    a) The current is lagging the voltage   b) The current is leading the voltage

    c) The current and voltage are inphase   d) The voltage is zero during resonant

23. What kind of matching network is good for the 50+j18Ω source and the 50Ω load?

    a) Low pass with the C close to the source and L close to the load.

    b) High pass with the L close to the source and C close to the load.

    c) Low pass with the L close to the source and C close to the load.

    d) High pass with the C close to the source and L close to the load.

24. Hi Z condition at PD_{out} of MC145152 occurs when?

    a) Positive trailing of F_R is leading the F_{IN} b) Positive trailing of F_R is lagging the F_{IN}

    c) F_R and F_{IN} are in phase   d) no correct answer

25. Image frequency can gives trouble to this receiver?

    a) Direct conversion   b) Super heterodyne

    c) TRF   d) no correct answer

26. This method can reduce the phase noise from the output of Integer N frequency synthesizer?

    a) Decrease Fr   b) Increase Fr

    c) Decrease N   d) Increase N

27. From Bessel's table from m_f = 2.41, what happen to the carrier the FM signal?

    a) The carrier disappear for a moment, then return.

    b) The carrier begin to disappear then become weaker.

    c) The carrier change to the value before the modulation begins.

    d) no correct answer

28. IP3 from an amplifier can be reduced by means of?

    a) Addition of an Attenuator at the input   b) Reduction of the V_{cc}

    c) Reduction of the Gain   d) Addition of a band pass filter

29. This problem can be solved by using the filter.

    a) IP3   b) IP2

    c) Spurious   d) Harmonics

30. The output of the Phase Frequency Detector is $+V_{DD}$ pulse for the whole period because......

    a) two inputs are in phase   b) It is in the phase detection mode

    c) It is in the phase lock mode   d) It is in the frequency detection mode

Q 31 – 40 : Answer the question in the blank space provided (2 points each)

31. An amplifier with the input and output impedance of 50 Ω has the voltage gain of 200, 100 KHz bandwidth, NF = 0. Calculate the V_N at the input at T = 300 K ....

32. The related P_N can be calculate and equal to...

33. Calculate the F_N...

34. Matching R_S 1000Ω to the 50+j18 Ω R_L at 1.5 MHz. Calculate the value of L and C for the low pass response matching circuit ?..

35. The power received from a satellite by a 2m^2 earth station antenna is 6 x 10^{-13} W. What is the total transmitted power from the antenna of the satellite if the path loss is 140 dB?

....

36. Can we use the low pass filter instead of the integrator for indirect FM generator?

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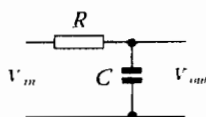
37. Reason for Q36. ....

38. The benefit from using 2 Modulus Pre-scaler instead of the Single Modulus Pre-scaler is..............

....

....

39. The benefits from using Fractional N instead of the 2 Modulus Pre-scaler is..

....

....

40. Explain the difference between Narrowband FM and Wideband FM besides the bandwidth.

....

Q41. Two amplifier with 1Hz bandwidth are connected as shown in the following diagram at T=290K .
Calculate the o/p noise power in dBm, o/p signal power in mW and o/p S/N in dB? (10 points)
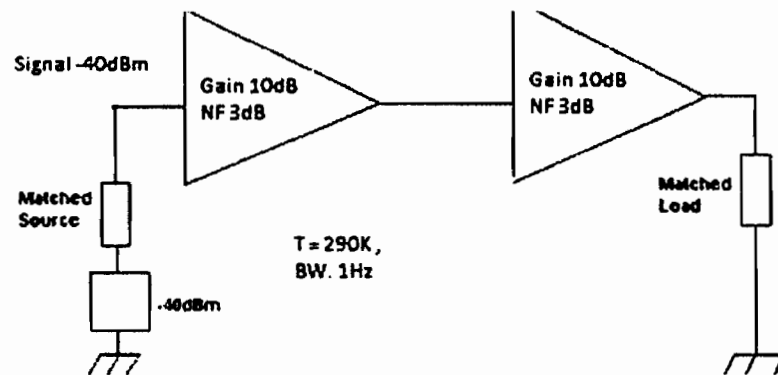
Q42. Calculate L,C,X_L,X_C of the L network with low pass response in order to match the source impedance of 50+j0 Ohms to the load with Z_L 200 Ohms at 800 MHz (5 points)

Q43. Calculate M and A when f_{VCO} = 550.050 MHz. Given R = 256 and 64/65 prescaler (5 points)
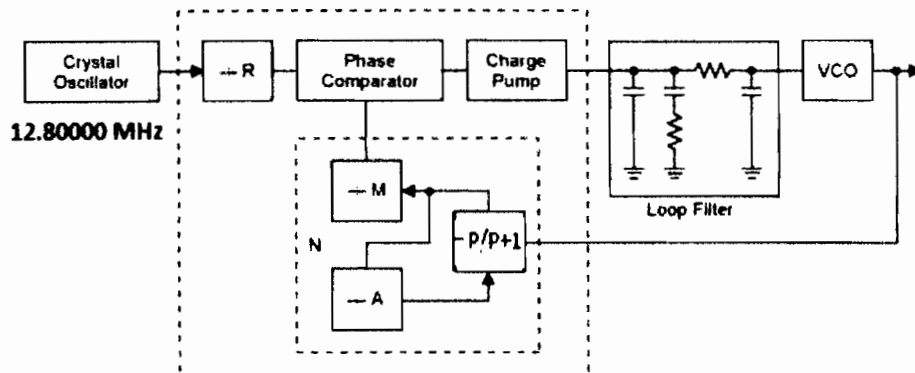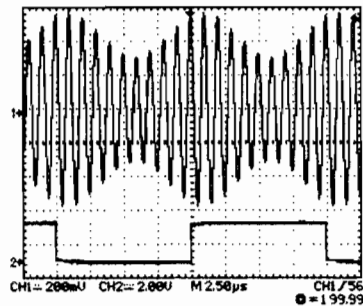
Q44. Describe the lock range and capture range from this diagram (5 points)
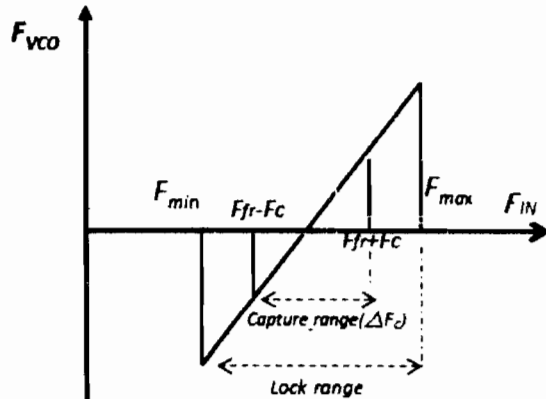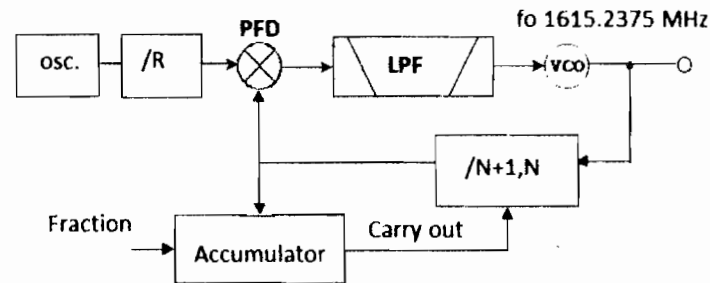

Solution

Q45. Calculate the total power of the AM waveform as shown in the picture. The carrier power is 10W (5 points)

Q46. Calculate the N_{eff}, N,K,F of the following fractional – N frequency synthesizer.(10 points.)

fo 1615.2375 MHz

1. calculate N_{eff} ....

2. Frequency step (F_r/F) ....

3. Reference frequency(F_r)..

4. calculate : reference freq./frequency step = resolution = F, ...

5. N+K/F ....

6. Fo ....

Q47. Draw the AM from Q45 in the vector form with respect to the scale of the modulation.(5 points)

Q48. A wideband amplifier is fed with 560 and 568 MHz, IMD may be found in the following frequencies? (5 points)

Name..ID. no..............................Department................................

Answer sheet (Mark X over the best choice)

1. (a) (b) (c) (d)	16. (a) (b) (c) (d)
2. (a) (b) (c) (d)	17. (a) (b) (c) (d)
3. (a) (b) (c) (d)	18. (a) (b) (c) (d)
4. (a) (b) (c) (d)	19. (a) (b) (c) (d)
5. (a) (b) (c) (d)	20. (a) (b) (c) (d)
6. (a) (b) (c) (d)	21. (a) (b) (c) (d)
7. (a) (b) (c) (d)	22. (a) (b) (c) (d)
8. (a) (b) (c) (d)	23. (a) (b) (c) (d)
9. (a) (b) (c) (d)	24. (a) (b) (c) (d)
10. (a) (b) (c) (d)	25. (a) (b) (c) (d)
11. (a) (b) (c) (d)	26. (a) (b) (c) (d)
12. (a) (b) (c) (d)	27. (a) (b) (c) (d)
13. (a) (b) (c) (d)	28. (a) (b) (c) (d)
14. (a) (b) (c) (d)	29. (a) (b) (c) (d)
15. (a) (b) (c) (d)	30. (a) (b) (c) (d)