



มหาวิทยาลัยเทคโนโลยีพระจอมเกล้าธนบุรี  
Seat Number

**King Mongkut's University of Technology Thonburi**  
**Final Examination**  
**Semester 1 – Academic Year 2011**

**Subject:** ENE 326 Electronics Communication Engineering

**For:** Electrical Communication and Electronic Engineering, 3<sup>rd</sup> Yr. (bilingual program)

**Exam Date:** September 28, 2011

**Time:** 09.00-12.00 am.

**Instructions:-**

1. This exam consists of 5 problems with a total of 11 pages, including the cover.
2. Only One A4 sheet is allowed and must submit with the papers
3. Answer each problem on the exam. papers itself.
4. KMUTT 'rule compiled calculator is allowed.
5. 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	8	TOTAL
Full Score									
Graded Score									

Name \_\_\_\_\_ Student ID \_\_\_\_\_

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

(Assoc. Prof. Wudhichai Assawinchaichote, Ph.D.)  
Head of Electronic and Telecommunication Engineering Department

**Instruction** Mark "X" over the selected choice in the given answer sheet page 11 ( 1 pt. each )

1. What is the frequency band that is suitable for space communication ?
  - a .MF
  - b. HF
  - c. VHF
  - d. UHF
2. Digital signal that is suitable for cable transmission ?
  - a .NRZ Bipolar
  - b .NRZ unipolar
  - c. RZ unipolar
  - d. RZ Bipolar
3. What will happen to FM Broadcast receiver equipped with the 250 microsec de emphasis network ?
  - a . hi tone will experience more attenuation
  - b. low tone will be louder
  - c. Noise will decrease
  - d .All correct
4. What is the result of feeding a  $\pm 75\text{KHz}$  FM into a FM narrowband detector ?
  - a .audio level will increase
  - b. audio will distorted
  - c .audio level will decrease
  - d. Audio will not be heard
5. MC145152 can be used in the receiver as ?
  - a .IF amplifier
  - b. mixer
  - c. Local oscillator
  - d. No correct answer
6. What is the circuit only found in the FM receiver?
  - a .diode detector
  - b. PLL
  - c. limiter
  - d .No correct answer
7. This parameter may come from the Local Oscillator ?
  - a .Harmonics content
  - b. Spurious frequencies
  - c. Noises sideband
  - d . All of above
8. This can be measured at some offset frequency from the carrier)
  - a .harmonics content
  - b. Spurious frequencies
  - c. noises sideband
  - d . Waveform distortion
9. What causes the squelch trigger to operate?
  - a .Noises
  - b. Intermediate frequency
  - c. Audio
  - d. Silence
10. What is the main function of the second IF
  - a .to reject the Image frequency
  - b .To limit the noises
  - c. to limit the bandwidth
  - d .To increase the gain
11. What is the main difference of Dolby compare to ordinary pre emphasis ?
  - a .Boost level is fixed
  - b. Time constant is shorter
  - c. Boost level also depends on input level
  - d . Time constant is longer

12. Limiting amplifier in the low power FM narrowband IF IC

- a .A single stage op amp.
- b. Multistage differential amp.
- c. Positive feedback
- d .All wrong

13. Using higher IF in the super heterodyne receiver tends to ?

- a. move the image frequency further
- b . move the image frequency closer
- c .make the bandwidth narrower
- d . No correct answer

14. What is the function of tank circuit in the quadrature detector?

- a .band pass the IF
- b .Block IF signal
- c .FM to PM Conversion
- d .Shift phase of the signal by 90 degrees

15. This one is between the Antenna and the FM receiver

- a. Band pass filter
- b .Low pass filter
- c .High pass filter
- d .Limiter

16. How to reduce the result of capture effect ?

- a .use Double conversion
- b. Add a low pass filter
- c. Add a band pass filter
- d .Add a Limiter

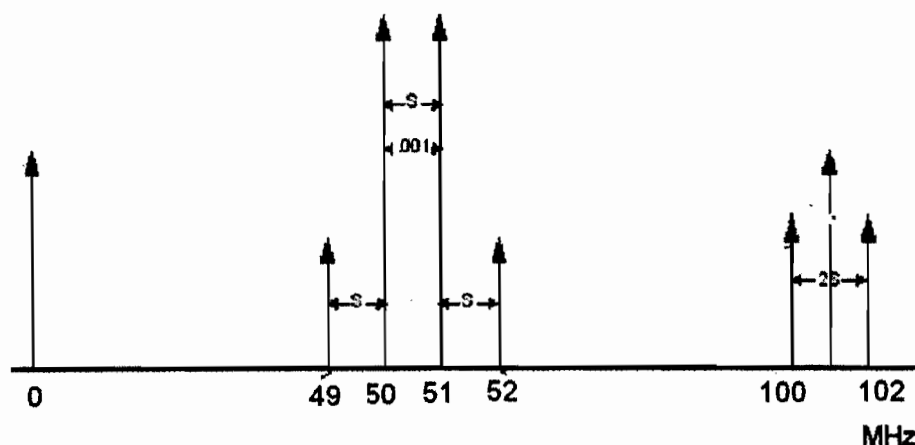
17. What is the square law characteristic?)

- a .Transfer characteristic look like square
- b. Transfer characteristic has second order terms
- c. Transfer characteristic has square root terms .
- d. No correct answer

18. Compare the baseband level of (L-R) dsb sc and ( L+R ) )

- a .similar
- b. (L-R) dsb sc > ( L+R ) )
- c. (L-R) dsb sc < ( L+R ) )
- d. (L-R) dsb sc is up to 38 KHz but ( L+R ) ) is constant

Use the following diagram to answer q.19 – q.23



19. Which frequency is the second order product?

- |           |            |
|-----------|------------|
| a. 25MHz  | b. 101 MHz |
| c. 52 MHz | d. 100 MHz |

20. Which frequency is the harmonic frequency?

- |           |            |
|-----------|------------|
| a. 25MHz  | b. 101 MHz |
| c. 52 MHz | d. 100 MHz |

21. Which frequency is the third order product?

- |           |            |
|-----------|------------|
| a. 25MHz  | b. 101 MHz |
| c. 52 MHz | d. 100 MHz |

22. Which frequency is the spurious frequency?

- |           |            |
|-----------|------------|
| a. 25MHz  | b. 101 MHz |
| c. 52 MHz | d. 100 MHz |

23. Which frequency is close to the fifth order product?

- |           |            |
|-----------|------------|
| a. 25MHz  | b. 101 MHz |
| c. 52 MHz | d. 100 MHz |

24. What is the main function of the first IF?

- |                              |                      |
|------------------------------|----------------------|
| a. image frequency rejection | b. noise control     |
| c. selectivity               | d. Bandwidth control |

25. What is the function of de emphasis

- |                                |                                |
|--------------------------------|--------------------------------|
| a. increase the high frequency | b. decrease the high frequency |
| c. control the deviation       | d. Decrease the low frequency  |

26. The higher the value of IP3 means ?

- |                   |                   |
|-------------------|-------------------|
| a. more linearity | b. gain is higher |
| c. less linearity | d. all of above   |

27. We can eliminate the third order products of the amplifier by ?

- |                                    |                               |
|------------------------------------|-------------------------------|
| a. use less input level than usual | b. use only one input freq.   |
| c. always set gain to maximum      | d. always set gain to minimum |

28. Which one produce only second order products?

- |                         |                         |
|-------------------------|-------------------------|
| a. Band pass filter     | b. Double balance mixer |
| c. single balance mixer | d. IF amplifier         |

29. Using squelch circuit is useful in ?

- |                                |                       |
|--------------------------------|-----------------------|
| a. improving the sound quality | b. Noise limiting     |
| c. control the annoying noises | d. Amplitude limiting |

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30. What is the disadvantage when using squelch?

- a. increase battery consumption
- b. High frequency will be attenuated
- c. low frequency will be attenuated
- d. Low level signal may not be heard

31. Some receiver use up conversion for ?

- a. image rejection
- b. Prevent IMD3
- c. eliminate harmonics
- d. Prevent IMD2

32. The low pass filter is installed next to the rf amplifier in order to ?

- a. image rejection
- b. Prevent IMD3
- c. eliminate harmonics
- d. Prevent IMD2

33. Which receiver has more than 2 frequency conversion stages?

- a. Satellite TV receiver
- b. SSB receiver
- c. VHF TV
- d. FM narrow band receiver

34. Which receiver use less bandwidth?

- a. Satellite TV receiver
- b. SSB receiver
- c. VHF TV
- d. FM narrow band receiver

35. Which receiver use more bandwidth?

- a. Satellite TV receiver
- b. SSB receiver
- c. VHF TV
- d. FM narrow band receiver

36. In Microwave frequency, reflection affects most on

- a. smooth terrain
- b. mountain area
- c. rough terrain
- d. ionosphere

37. Skip distance can be made smaller by

- a. increase the launch angle
- b. decrease the launch angle
- c. increase the power
- d. decrease the power

38. F1 and F2 is separated because of

- a. solar flare
- b. sun spot
- c. sun shine
- d. none of above is correct

39. What happen when D layer reflects the radio frequency?

- a. hop distance will be shorter
- b. hop distance will be longer
- c. Hop distance will not be effected
- d. Radio will bounce back to transmitter

40. This type of Repeater can drop/insert traffic

- a. Passive repeater
- b. RF repeater
- c. Heterodyne repeater
- d. Regenerative repeater

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41. This type of Repeater consume less energy

- a. Passive repeater
- b. RF repeater
- c. Heterodyne repeater
- d. Regenerative repeater

42. This type of Repeater can only change the beam direction

- a. Passive repeater
- b. RF repeater
- c. Heterodyne repeater
- d. Regenerative repeater

43. What is the current and voltage at quarter wavelength from the opened end of a tx. line ?

- a. current max,voltage min
- b. current max,voltage max
- c. current min,voltage min
- d. current min,voltage max

44. What is the current and voltage at quarter wavelength from the shorted end of a tx. line ?

- a. current max,voltage min
- b. current max,voltage max
- c. current min,voltage min
- d. current min,voltage max

45. What is the best insulator for a coaxial transmission line?

- a. Vacuum
- b. air
- c. ceramic
- d. none of above is correct

46. What is the reason to change the polarize of the transmitting RF at the repeater ?

- a. To follow the regulation of the Authority
- b. To eliminate the tendency of oscillation
- c. To match the requirement at the receiving site
- d. none of above is correct

47. What is the effect of ducting in wave propagation?

- a. Signals are trapped between atmospheric layers of different temperature
- b. Signals are trapped in the duct of ionosphere layer
- c. Signals are trapped between F1 and F2 layers
- d. none of above is correct

48. A Tropo scatter Radio Terminal always equipped with 2 antennas in order to?

- a. Use as transmit and receive separately
- b. Increase the gain of the system
- c. counter act the multi path phenomenon
- d. None of above is correct

49. What kind of wireless communication is mostly replaced by satellite communication?

- a. MF Broadcasting
- b. HF communication
- c. VHF communication
- d. None of above is correct

50. In order to make a low loss coaxial cable at higher frequency, we must?

- a. use the material with low  $\epsilon_r$  as the insulation
- b. use the material with high  $\epsilon_r$  as the insulation
- c. use the rigid outer conductor instead of braided type
- d. none of above is correct

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51. The Front to back ratio of a good dipole should be?

- a. around 10
- b. around 5
- c. around 2
- d. around 1

52. Compare  $-100 \text{ dBm}$  and  $1 \times 10^{-6} \text{ V}_{\text{rms}}$  for a  $50 \text{ Ohms}$  load?

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

53. Which one can improve the selective fading problem?

- a. polarized diversity
- b. space diversity
- c. frequency diversity
- d. all is correct

54. Which one can improve the multipath fading problem?

- a. polarized diversity
- b. space diversity
- c. frequency diversity
- d. all is correct

55. Which one can improve the indoor propagation in the building ?

- a. polarized diversity
- b. space diversity
- c. frequency diversity
- d. all is correct

56. Which one is best described for Line of Sight propagation?

- a. radio horizon is further than optical horizon
- b. radio horizon is equal to optical horizon
- c. optical horizon is further than radiol horizon
- d. all is wrong

57. Convert  $20 \text{ dB}$  return loss to VSWR ?

- a. 1.202
- b. 1.212 dB
- c. 1.222
- d. all is wrong

58. What is not true for QPSK signal ?

- a. bandwidth is half of BPSK
- b. adopted IQ modulator
- c. class C amplifier can be use
- d. all is not true

59. How to improve the efficiency in AM Transmitter ?

- a. apply the Pulse Width Modulation techniques.
- b. apply the quasi square wave.
- c. apply the digital techniques
- d. all is correct

60. What is not the benefits in applying circular polarization in FM transmitting ?

- a. better tolerate to weather condition
- b. can be received by antenna of any polarize
- c. better in multipath situation
- d. none of above

ถาวร หอสมุด

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2. Write down the answer in the space below ( 15 points)

2.1 Calculate the velocity factor of a transmission line with PVC insulation ( $\epsilon_r = 3$ ) ( 3 points)

2.2 Calculate  $Z_0$  of a parallel transmission line which have  $\varnothing$  4mm connectors space 300 mm apart by PVC ( 3 points)

2.3 Calculate the diameter ( $\varnothing$ ) of outer conductor of a 50 Ohms coaxial cable .Given inner  $\varnothing = 1.5$  mm( 3 points)

2.4 Calculate the Gain (dBi) of an antenna which has  $A_e = 1\text{m}^2$  operate at 10GHz ( 3 points)

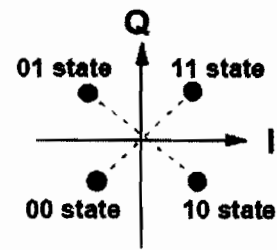
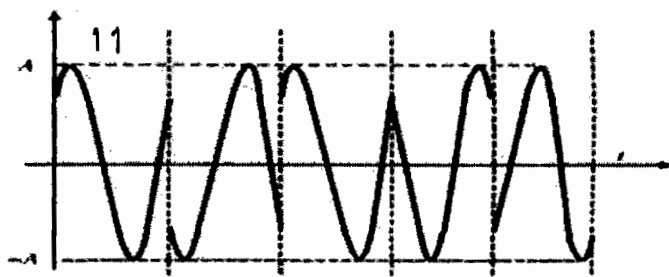
2.5 Calculate reflection coefficient ( $\Gamma$ ) when the measured VSWR is 1.75 ( 3 points)



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3. Answer the questions about the diagrams ( 10 points)

3.1 Given this waveform showing the first symbol and its bit sequence 11 (5 points)

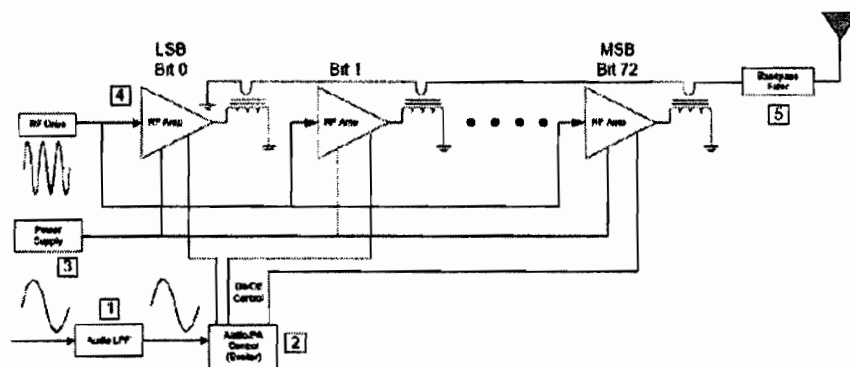


1 symbol comprising I&Q

Q.What is the sequence from left to right ?

A.....

3.2 Explain the operation of the above diagram (5 points)

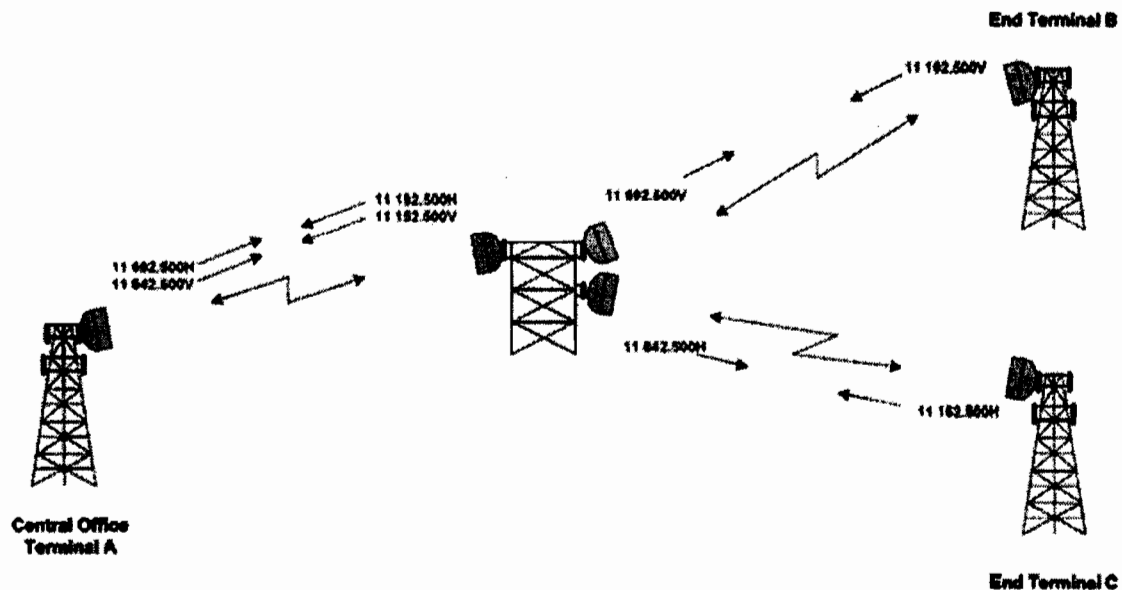


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4. Explain the bandwidth efficiency of the digital modulation including some examples (5 points)

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5. Use this diagram to answer the questions below. ( 10 points)



Given: all antenna has 40 dBi of gain at their operating frequency ( use 11.7GHz for all calculation)

Waveguide running from each antenna to Tx or Rx is 40 m. long and producing 6 dB of loss.

Distance from A to repeater is 15 Km, Distance from repeater to B is 11 Km, repeater to C is 8 Km,

Repeater is the regenerative type and has tx power level of +25 dBm

5.1 Calculate the Free space Loss between Terminal A and the Repeater .....

5.2 Calculate the Free space Loss between Terminal B and the Repeater... ..

5.3 Calculate the Free space Loss between Terminal A and the Repeater .....

5.4 Calculate the Received RF level at Repeater ( From A)... ..

5.4 Calculate the Received RF level at Repeater ( From B)... ..

5.4 Calculate the Received RF level at Repeater ( From C)... ..