



Seat no.

King Mongkut University of technology Thonburi

Final Examination 1/2557

Subject: EIE 326 Electronics Communication Engineering

3<sup>rd</sup> yr. in Electrical Communication and Electronic Engineering (Intl. program)

Date: December 2<sup>nd</sup>, 2014

Hrs. 09:00AM -12:00PM

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**Instructions:-**

1. There are 14 questions in 10 pages(including this page) total score of 120 points
2. One page of your A4 size note is allowed and must be submitted with the papers
3. Answer Q1 in the answer sheet and Q2 – Q14 in the space provided
4. KMUTT approved calculator can be used
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 lead to the highest penalty

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The Exam. Papers are designed by

Assist. Prof. Chanin Wongngamkam (9070)

The Exam. Papers have been approved by the committee of the department

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1. Mark X over the selected choice in the answer sheet. ( 1 points each )

1.1 HF long range communication can have better result during the day or the night?

- a.) During the night
- b.) During the day
- c.) Summer time
- d.) Not depend on day time or night time

1.2 What is the atmospheric layer that terrestrial UHF radio wave propagate?

- a.) Ionosphere
- b.) Troposphere
- c.) Exosphere
- d.) Mesosphere

1.3 Name the ability of the radio waves to bend around the obstruction and still travel

- a.) Refraction
- b.) Reflection
- c.) Diffraction
- d.) Radiation

1.4 What type of repeater can provide less gain?

- a.) RF repeater
- b.) Regenerative repeater
- c.) Heterodyne repeater
- d.) None of above is correct

1.5 What will happen when the radio wave hit surface of the lake?

- a.) small part of the RF energy still penetrate into the water
- b.) No RF energy penetrate into the water
- c.) Most of the RF energy reflect back in the same direction
- d.) Most of the RF energy are absorbed

1.6 Which parameter of the wave may be altered after travelling into the atmosphere?

- a.) Frequency
- b.) Wavelength
- c.) Velocity
- d.) Polarize

1.7 What is the application of the passive wireless repeater?

- a.) Change the direction of the radio waves beam
- b.) Provide gain
- c.) Change frequency
- d.) Drop/insert

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- 1.8 If the electrical length of a matched dipole antenna is shorter than the operating frequency?
- a.) The efficiency will be decreased.
  - b.) The reflection will be increased.
  - c.) The impedance of the antenna will change
  - d.) All is correct
- 1.9 Which one is not the parasitic element of the Yagi antenna?
- a.) Dipole
  - b.) Reflector
  - c.) Director
  - d.) None of above is correct
- 1.10 What is the difference in electrical properties between RZ and NRZ ?
- a.) Clock information
  - b.) DC component
  - c.) Pulse width
  - d.) All is correct
- 1.11 Tx line with  $Z_0$  of  $50\ \Omega$  connected from a transmitter with  $50\ \Omega$  output impedance to a  $50\ \Omega$  load. If another  $\frac{1}{4}\ \lambda$  length of tx line is added. What will happen?
- a.) VSWR will increase
  - b.) VSWR equal to 0
  - c.) VSWR will decrease
  - d.) VSWR still the same
- 1.12 If the 50 Ohms line is short circuit at one end. Which one is correct
- a.)  $\Gamma = -1+j0$
  - b.)  $\Gamma = 1+j0$
  - c.)  $|\Gamma| = 1$
  - d.)  $\Gamma = 0 - j1$
- 1.13 If the Sector Power Ratio or SPR of the base station is increased. What will happen?
- a.) More beam squint
  - b.) More hand off
  - c.) More cross polarization
  - d.) More reflection
- 1.14 Grounding at the tower of the radio base station is for
- a.) Antenna circuit
  - b.) Lightning protection
  - c.) Safety ground from high voltage
  - d.) none of above is correct

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- 1.15. Current distribution at the dipole antenna is minimum at?
- a.) Both ends
  - b.) Left end
  - c.) right end
  - d.) Middle
- 1.16 Which one of these antenna need ground in its circuit?
- a.) Yagi
  - b.) Dipole
  - c.) Quarter wave
  - d.) Loop
- 1.17 AM broadcast radio station can transmit beyond the horizon by
- a.) Surface wave
  - b.) Direct wave
  - c.) Sky wave
  - d.) Line of sight
- 1.18 Which one is the most valuable layer for skywave communication?
- a.) D
  - b.) E
  - c.) F
  - d.) G
- 1.19 Why the COFDM can withstand the selective fading?
- a.) Because of the IFFT process
  - b.) Because of the channel coding
  - c.) Because of the interleaver
  - d.) Because there are many redundant SCs.
- 1.20 From COFDM theory, which one is done in the frequency domain?
- a.) channel coding
  - b.) Guard insertion
  - c.) IQ modulation
  - d.) Scrambler
- 1.21 From Line coding theory, we want to minimize the loss of the signal in the cable by
- a.) Choosing the pulse shape that has no high frequency component.
  - b.) Choosing the pulse shape that has no dc component.
  - c.) Choosing the pulse shape that minimize long string of zero.
  - d.) Choosing the pulse shape that has narrow bandwidth.
- 1.22 From Line coding theory, we want to extract the timing of the data by
- a.) Choosing the pulse shape that has no high frequency component.
  - b.) Choosing the pulse shape that has no dc component.
  - c.) Choosing the pulse shape that minimize long string of zero.
  - d.) Choosing the pulse shape that has narrow bandwidth.

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1.23 One end of the lossless  $50\Omega$  line is connected to  $50\Omega$  RF source and the other is short circuit, the standing wave voltage at this end will be

- a.) equal to 0
- b.) equal to  $V_{source}$
- c.) equal to  $\frac{1}{2} V_{source}$
- d.) none of above is correct

1.24 If the standing wave voltage can be measured at  $\lambda/2$  from the short circuit end, What will be the standing wave voltage at this point?

- a.) equal to 0
- b.) equal to  $V_{source}$
- c.) equal to  $\frac{1}{2} V_{source}$
- d.) none of above is correct

1.25 Which one makes COFDM suitable for 4G/LTE ?

- a.) It has higher bandwidth
- b.) it can withstand multipath propagation effect
- c.) it can withstand selective fading
- d.) it can withstand narrowband interferer

1.26 Which one may cause sudden fading?

- a.) Interferences
- b.) Atmospheric absorption
- c.) Skip distance
- d.) Multipath

1.27 Which one makes 16 QAM better than 16PSK?

- a.) Bandwidth
- b.) Less effect from noises
- c.) Amplitude flatness
- d.) all is correct

1.28 In HDB3, which is the correct rule for B substitution?

- a.) every V bit need one B bit.
- b.) B is substituted at the first bit of 0000 if no. of mark are even.
- c.) B is substituted after the V if no. of mark are odd.
- d.) all is correct.

1.29 We may concluded that 18 GHz radio link is more suitable in the city than 1.5 GHz radio link: this is related to

- a.) Path loss
- b.) Fresnel Zone
- c.) Line of sight
- d.) Radio horizon

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1.30 Suggest the technique to overcome the multipath propagation

- a.) MIMO
- b.) Frequency diversity
- c.) Space diversity
- d.) all is correct

**2. Answer the questions in the space provided (30 points)**

2.1 Calculate the symbol rate of the 64QAM with data rate of 50Mbit/s? (2 points )

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2.2 Calculate the channel spacing of the FFT with 2048 bins in 1.6 MHz Bandwidth? (2 points )

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2.3 Calculate the propagation time of the wave in the 800 meters tx line which has the velocity factor of 66% ? (2 points )

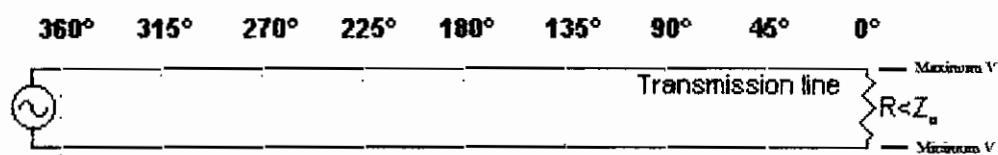
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2.4 Calculate the  $Z_0$  of the parallel line with  $\emptyset$  of 1 mm. space at 6 mm. apart . The dielectric constant is 1 (3 points )

2.5 From the Channel capacity limit theory, calculate the channel capacity of a 8 MHz UHF TV when the  $C/N = 21$  dB (3 points )

2.6 A  $50\ \Omega$  coaxial has  $\emptyset$  of the outer conductor of 35 mm., the dielectric constant is 2.1 .Find the diameter of the inner conductor? (3 points )

2.7 Draw the standing wave in the TX line with  $Z_0$   $50\ \Omega$  that one end connected to  $25\ \Omega$  load (3 points )



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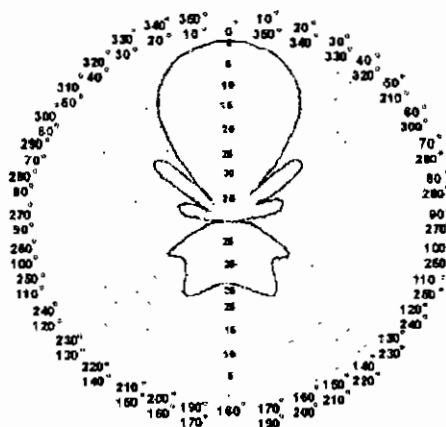
2.8 Find the velocity of wave in FR4( $\epsilon_{\text{reff}} = 4.6$ ) in percentage of its velocity in free space ? (4 points )

2.9 Find the gain in dB of a  $\varnothing$  0.5 m. dish antenna operating in the 12 GHz at 70 % efficiency? ( 3 points )

2.10 A transmit antenna for 700 MHz installed at 200 m. above ground. A receiver is at 5 Km. from the radio horizon distance ( $K = 4/3$ ). Calculate the path loss and the maximum vertical clearance of the 1<sup>st</sup> Fresnel Zone.? (5 points )

3 Describe the method to design a L matching circuit by using the Smith chart in order to match (5 points )

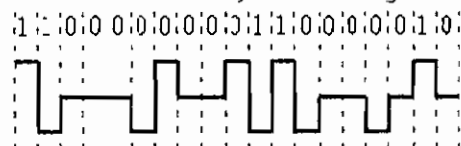
4 Read the following parameters from the picture below. (5 points )



- 4.1 F/B ratio = .....dB
- 4.2 Null position.....degree
- 4.3 Half power beamwidth.....degree
- 4.4 Maximum sidelobes.....degree

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5. Describe your knowledges of Fading? (5 points )
6. Describe the Sky wave propagation with these words in the paragraph: critical frequency, critical angle, ionosphere and skip distance (5 points )
7. Describe the GMSK modulation and compare to QPSK? (5 points )
8. Describe the benefits of Channel Coding in the digital communication including examples? (5 points )
9. Describe HDB3 waveform bit by bit starting from the left. (5 points )



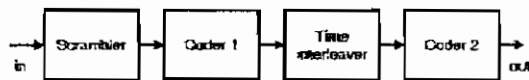


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10. Draw an EYE diagram and explain how to verify the diagram? (5 points )

11. How can we minimize the interferences between each SC ? (5 points )

12. Describe each of the following blocks? (5 points )



13.VSWR reading of an antenna is 1.15.If the input power to this antenna is 50 watts, calculate the power that can be transmitted. (5 points )

14.What can you tell from this 802.11a OFDM? (5 points )



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**Answer sheet for Q1 from 1.1 - 1.30**

Mark only one X over the selected choice for each answer

- |                             |                             |
|-----------------------------|-----------------------------|
| 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 ) |