

KATHMANDU UNIVERSITY  
End Semester Examination  
June/July, 2019

Marks Scored:

Level : B.E.

Year : IV

Course : ETEG 432

Semester : II

Exam Roll No. :

Time: 30 mins.

F.M. : 10

Registration No. :

Date :

SECTION "A"

[20 Q × 1 = 20 marks]

Encircle the most suitable answer to the following questions.

- In Nepal, 3G works in.....band
  - 800 and 1800 MHz
  - 900 and 1800 MHz
  - 900 and 2100 MHz
  - 2300 MHz
- In wireless communication, OFDM is commonly used in order to reduce
  - Interference
  - Noise
  - Dispersion
  - Congestion
- In cellular mobile communication, the power level transmitted by MSs are controlled by
  - MSs
  - BTS
  - BSC
  - MSC
- If user makes in average 2 calls every hour and if his call lasts in average 7 minute 45 seconds and 2 minutes 5 seconds, respectively; the traffic intensity equals to
  - 0.123
  - 0.15
  - 0.164
  - 0.035
- Friis free space equation shows that the received power falls off at rate of
  - 10 dB/decade
  - 20 dB/decade
  - 30 dB/decade
  - 40 dB/decade
- Far field distance of an antenna with maximum dimension of 1.36 m and operating frequency of 900 MHz equals to
  - 4.12m
  - 5.57m
  - 5.60m
  - 11.20m
- Among the following, .....model also considers refractivity of troposphere during path loss calculation
  - Hata model
  - Okumura model
  - Longley Rice model
  - Log-normal shadowing model
- Relation between gain and effective aperture is given by.....
  - $G = \frac{4\pi A_e}{\lambda^2}$
  - $G = 4\pi\lambda^2 A_e$
  - $G = \frac{4\pi\lambda^2}{A_e}$
  - $G = \frac{4\pi A_e}{\lambda}$
- In Log-Distance path loss model, path loss exponent (n) for free space is taken as .....
  - 1
  - 2
  - 3
  - 4

10. In indoor propagation models, building with large amount of metal and open isles have delay spread up to  
a. 30 ns                      b. 100 ns                      c. 300 ns                      d. 600 ns
11. Among the following,.....leads to fast fading  
a. Higher doppler spread                      b. Lower doppler spread  
c. Multipath delay spread                      d. Lower signal bandwidth
12. Flat fading channel is also known as.....  
a. Amplitude varying channel                      b. Frequency varying channel  
c. Phase varying channel                      d. Wideband channel
13. In case the channel is complex Gaussian with non-zero mean, the envelop is  
a. Rayleigh distributed                      b. Ricean distributed  
c. Gaussian distributed                      d. Log normal distributed
14. ISI occurs when  
a. Modulation bandwidth fall behind coherence bandwidth  
b. Modulation bandwidth exceeds coherence bandwidth  
c. Modulation bandwidth and coherence bandwidth are same  
d. Equalizer is adaptive
15. QPSK provides twice the bandwidth efficiency and .....energy efficiency in comparison to BPSK  
a. Half                      b. Same                      c. Twice                      d. Four times
16. In this diversity, each signal branch is multiplied by a weight factor proportional to the signal amplitude  
a. Selection diversity                      b. Feedback diversity  
c. Maximal ratio combining diversity                      d. Equal gain diversity
17. Following is the IEEE working group which is working towards SDR  
a. IEEE P1900                      b. IEEE P1823                      c. IEEE P1450                      d. IEEE P1015
18. In Ethernet, nodes can retry  
a. 8 times                      b. 10 times                      c. 12 times                      d. 16 times
19. In 10Base-T Ethernet, the maximum supported distance is  
a. 500 m                      b. 185 m                      c. 100 m                      d. 2000 m
20. Among the following, ..... is the first WLAN to use OFDM  
a. IEEE 802.11a                      b. IEEE 802.11e                      c. IEEE 802.11g                      d. IEEE 802.11n

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F. M. : 40

SECTION "B"

*Attempt ALL questions.*

*Assume any suitable data if necessary. Figures in margin indicate full marks for each questions.*

1.
  - a. Write any three advantages and three disadvantages of wireless communication system. [3]
  - b. Write about any two techniques that can be used to deal with high bit error rates in wireless communication links. [2]
2.
  - a. Briefly explain the mechanism of Open-loop power control and Closed-loop power control used in cellular radio system. [3]
  - b. Write difference between loss trunked system and delay trunked system with their pros and cons. [2]
3.
  - a. Although there was Okumura model already available for use, why do you think the Hata Model was developed? [2]
  - b. Using Hata model, find the mobile antenna correction factor and pathloss for a medium size city assuming carrier frequency as 950 MHz, height of transmitting antenna at base station is 45m, propagation distance between antennas is 10 km and height of receiving antenna in mobile station is 5m. [3]

[ *Hint: select the appropriate correct mobile antenna correction factor from the following*

$$a(h_{re}) = (1.1 \log f_c - 0.7)h_{re} - (1.56 \log f_c - 0.8) \text{ dB}$$
$$a(h_{re}) = 3.2(\log 11.75h_{re})^2 - 4.97 \text{ dB} \quad \text{for } f_c \geq 300 \text{ MHz}$$
$$a(h_{re}) = 8.29(\log 1.54h_{re})^2 - 1.1 \text{ dB} \quad \text{for } f_c \leq 300 \text{ MHz}$$

]
4.
  - a. List any three physical factors that can influence the fading in mobile radio system and then discuss how they can influence. [3]
  - b. Why the Rayleigh distribution system provides a good fit into the measured signal amplitudes in NLOS environment, give reason? [2]
5.
  - a. We often need to tradeoff between power efficiency and bandwidth efficiency in digital communication, why? [2]
  - b. List down any three advantages of spread spectrum modulation in wireless communication. [3]
6.
  - a. What is MIMO and why MIMO MAC is being considered very important recently by academician or researchers? [2]
  - b. Highlight the benefits of adaptive strategy over switched strategy in interference rejection while using smart antenna. [3]

7.
  - a. Envision advantages that could be achieved from SDR while deploying future cognitive radio based networks. [3]
  - b. Classify four different types of Ethernet. [2]
8.
  - a. Why do we need CSMA/CA instead of CSMA/CD in WLAN? [2]
  - b. How hidden node and exposed node problems are addressed in WLAN, illustrate with an example. [3]