THE UNIVERSITY OF AUCKLAND

SECOND SEMESTER, 2013
Campus: City

COMPUTER SCIENCE

Modern Data Communications

(Time allowed: 40 minutes)

NOTE:

- Enter your name and student ID into the Teleform sheet FIRST.

- THEN: Attempt *all* questions!

- All questions have ONE correct answer.

- DO NOT tick two answers as correct for the same question.

- If you believe that there is an error in a question (multiple correct answers or no correct answer), select the answer you believe was intended as the correct one and contact the test room supervisor after the test.

- Keep your question book. Writing on the question book will not be marked.

- Use of calculators is NOT permitted.

- Good luck!

1. Given odd parity on 1-bits, which of the following combinations of 8 data bits and 1 parity bit is in error?

   A. 111001111

   B. 000000111

   C. 011100010

   D. 110100011

   E. 101110010

2. Which of the following is the most effective way to keep an 802.11 wireless secure and private?

   A. Configure its access point so as not to broadcast its SSID (WLAN identifier)

   B. Use 802.11i (WPA2), that uses AES encryption and 802.1X authentication

   C. Use Wireless Equivalent Privacy (WEP), that uses RC4 encryption

   D. Use WPA (Wi-Fi Protected Access), that uses RC4 encryption

   E. Configure its access point to only recognise a small set of 802.11 MAC addresses

3. A power ratio of 2500:1 corresponds to roughly how many dB?

   A. 50 dB

   B. 34 dB

   C. 36 dB

   D. 25 dB

   E. 53 dB

4. Which of the following is the greatest advantage of using the 2.4 or 5 GHz bands of radio frequencies for 802.10 wireless networking?

   A. Those bands are unregulated, i.e. one may use them without a license

   B. Signals in those bands have an effective range of tens of metres

   C. The 2.4 GHz band is highly subject to interference

   D. Frequency modulation techniques can be used in that band

   E. Signals in those bands tend to bounce off concrete walls, but they can penetrate thin walls

5. Which of the following prevents a digital signal from having instantaneous transitions between two amplitudes that represent the bit values 0 and 1?

> A. Any transmitter has a limit to its power.
>
> B. Any real communication channel has a limited bandwidth.
>
> C. The channel will always add some random noise to the signal.
>
> D. The transmitter's battery life is limited.
>
> E. The clocks of transmitter and receiver are never in perfect synchronisation.

6. Assume that a fibre from Auckland to Tauranga is 200 km long, and is used to provide a 10 Mb/s link. Approximately how long does it take for a 1500-byte frame to be sent out and acknowledged? (Hints: light travels at 2×10^8 m/s in optical fibre; you may ignore the time needed to transmit the short ACK frame).

> A. 1.2 ms
>
> B. 2.0 ms
>
> C. 4.0 ms
>
> D. 3.2 ms
>
> E. 2.2 ms

7. Which of the following parameters are required to describe a sinusoidal signal?

> A. Amplitude, phase, DC offset
>
> B. Frequency, amplitude, power
>
> C. Amplitude, frequency, DC offset
>
> D. Power, phase, amplitude
>
> E. Frequency, amplitude, phase

8. If the signal-to-noise ratio at the receiver of a digital radio link with bandwidth B Hz rises from 92 dB to 101 dB, approximately by which amount does the theoretical channel capacity rise?

> A. By $8B$ bits/s
>
> B. By a factor of 3
>
> C. By a factor of 9
>
> D. By $3B$ bits/s
>
> E. By a factor of 8

9. Amplitude shift keying of a carrier signal with a square wave of frequency f...

   A. causes two sidebands only

   B. is the same as phase shift keying.

   C. causes sidebands at $+/-f$ Hz, $+/-3f$ Hz, $+/-5f$ Hz etc. around the carrier frequency

   D. causes no sidebands to appear in the power spectrum

   E. causes the same power spectrum as frequency shift keying the carrier

10. The speed of light in a fibre optic cable is 200,000 km per second. If we operate a fibre optic cable at 1,000 **Mbit/s**, how "long" will a 1,000 **byte** packet be on the cable?

    A. 50 cm

    B. 40 m

    C. 1.6 km

    D. 16 km

    E. 400 m

11. What is the remainder of the modulo-2 division of 100110 by 11001?

    A. 1100

    B. 0001

    C. 1101

    D. 0010

    E. 1001

12. An Ethernet hub is a multiport repeater. Which of the following is NOT a property of an Ethernet hub?

    A. A hub copies an input signal on any port to all its other ports

    B. A hub splits up a collision domain, thereby reducing contention problems within that domain

    C. A hub regenerates degraded signals

    D. A hub does not have to be configured

    E. A hub adds to the transmission delay within a collision domain

13. Which of the following best describes what determines shared-bus Ethernet's minimum frame size?

    A. Signal delay time through an Ethernet repeater
    B. Maximum size of an Ethernet segment
    C. Number of hosts attached to a collision domain
    D. Maximum number of repeaters in a collision domain
    E. Worst-case time for a signal to pass through a collision domain

14. Which value should the maximum noise amplitude in 256 QAM not exceed?

    A. 1/16th of the maximum signal amplitude.
    B. 16 times the channel capacity.
    C. 256 times the bandwidth.
    D. The noise power.
    E. 1/256th of the maximum signal amplitude.

15. A power ratio of 62 dB corresponds to a voltage ratio of...?

    A. 68 dB
    B. 62 dB
    C. 124 dB
    D. 56 dB
    E. 65 dB

16. An Ethernet switch is a multiport bridge. What does a switch do if it receives a packet with a destination MAC address it doesn't know?

    A. Broadcast a query to all ports asking hosts to send their MAC addresses
    B. Discard the packet
    C. Send the packet out through all its ports
    D. Ignore the packet until the switch sees an incoming packet with that MAC address as its source
    E. Send a message to the Network Administrators asking them to add the unknown MAC address to the switch's configuration

17. Which of the following best describes layer 2, the *Link* layer?

A. It transmits frames to other hosts via the medium that connects the hosts

B. It sends frames to other hosts, and receives frames in response

C. It multiplexes data over a link to other hosts

D. It passes data between applications on two or more hosts

E. It passes packets between different LANs

18. Which of the following statements about transmission modes is TRUE?

A. In full-duplex, messages can never go in both directions at the same time

B. In full-duplex, messages can go in both directions at the same time

C. In full-duplex, messages can go only in one direction at a given time

D. In half-duplex, messages can go only in one direction but never in the opposite direction

E. Messages cannot be sent on a single wire using full-duplex

19. Apply standard bit stuffing to 01111110001110000001100111110.

A. 0111111000011100000011001111100

B. 0111110100011100000010011111100

C. 0111110100011100000001100111110

D. 0111111000011100000010011111100

E. 0111111000111000010100111110

20. Which of the following could be a set of neighbouring constellation points for 0111 in a Gray code for 16 QAM?

A. 0011, 0101, 1111, 0110

B. 0010, 1101, 1111, 1110

C. 1001, 1101, 0001, 0000

D. 0011, 1101, 1011, 1110

E. 1001, 0101, 0001, 1000

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