Midterm Computer Networks X_400487

Please read the following information carefully!

- This exam consists of 10 multiple-choice questions. Each question is worth 320 points.
- You have **60 minutes** to complete this exam.
- Before you hand in your answers, check that your multiple-choice form contains your name and student number, also filled in using the boxes.
- Opening this exam before you are instructed to start is **strictly prohibited**.
- The use of the book, notes, calculators, smartwatches and other aids is **strictly prohibited**.
- Tip: mark your answers on this exam **first**, and only after you are certain of your answers, copy them to the multiple-choice answer form.

1. You decide to start your own company in data transfer. Your aim is to service areas with little to no infrastructure. To this end, you equip a flock of trained seagulls with 1 terabyte (10^{12} **bytes**) USB flash drives. Your flock is 50 birds in size. Assume that your seagulls fly at an average speed of 16 meters per second. Ignoring overhead, what is the bandwidth (in bits per second) of your data transfer service, when transferring data over a distance of 4000 km?
   Hint: watch the unit conversions!
   A. 32 Mbps
   B. 200 Mbps
   C. 1.6 Gbps
   D. 16 Gbps

2. What is a valid reason to select a layered architecture instead of a monolithic architecture?
   A. A layered architecture increases the performance of the system.
   B. A layered architecture makes the system easier to understand.
   C. A layered architecture makes the system more secure.
   D. A layered architecture reduces the overhead of the system.

3. When building a home automation system, you want to send the live video feed from a camera to your home server for processing. The camera records video at 25 fps and has a resolution of 2048×1024 pixels. Each pixel value is stored in 8 bits. The video is transmitted without compression. Because you are a student, you want to buy the cheapest type of wire that can still transmit the video data to your home server. Which one should you buy?
   A. Type A: 100 Mbps. 2 Euro.
   B. Type B: 500 Mbps. 10 Euro.
   C. Type C: 1 Gbps. 15 Euro.
   D. Type D: 5 Gbps. 25 Euro.

4. Match the properties below to the right concept.
   1. Available bandwidth is dynamic.
   2. Data arrives in order.
   3. Data is stored and forwarded.
   4. Switch crash is fatal.

   A. Circuit switching (1)(2), Packet switching (3)(4).
   B. Circuit switching (1)(3), Packet switching (2)(4).
   C. Circuit switching (2)(4), Packet switching (1)(3)
   D. Circuit switching (3)(4), Packet switching (1)(2).

5. You want to figure out the maximum data rate, r, of a channel. Using Shannon's theorem, you obtain the value s. Using Nyquist's theorem you obtain the value n. Assume that both values are correct. What can you say about r?.
   A. $r \leq \mathbf{min}(n, s)$
   B. $r \leq \mathrm{max}(n, s)$
   C. $n \leq r \leq s$
   D. $s \leq r \leq n$

6. See Figure 1. Considering this constellation diagram, what is the maximum number of bits per symbol when using this version of passband transmission?

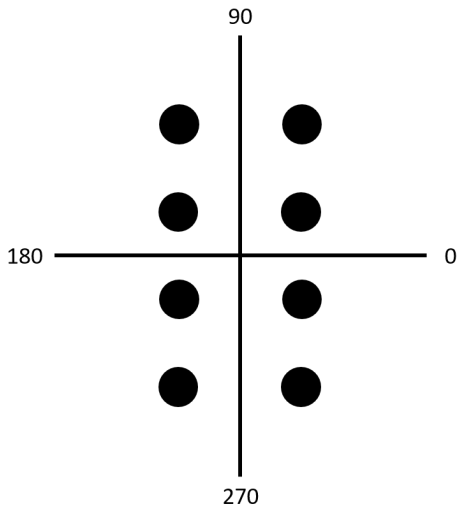

Figure 1

A. 2

B. 3

C. 4

D. 8

7. You want to transmit the frame 10011010010 over a wire. When using a CRC error detection code with generator 10011, what is the corresponding codeword for this frame? The answers contain a space to improve readability.

A. 10011010010 1

B. 10011010010 0001

C. 10011010010 0011

D. 10011010010 00110

8. Indicate for each of the following statements if they are true or false.
(I) Go-back-n makes more efficient use of bandwidth than selective repeat.
(II) Go-back-n makes more efficient use of buffer space than selective repeat.

A. (I): false, (II): false

B. (I): false, (II): true

C. (I): true, (II): false

D. (I): true, (II): true

9. You receive the codeword 11011001100. You know that the code word includes a Hamming code for error correction, and that the check bits are computer for **even** parity. You find that the error syndrome is 0011 (you can check if you want to!). What does this error syndrome indicate?

    A. The code word contains 0 single bit errors, because the error syndrome has even parity.

    B. The code word contains 3 single bit errors.

    C. The code word contains a single bit error at bit location $2^3 = 8$.

    D. The code word contains a single bit error at bit location 3.

10. A device uses bit stuffing with the flag sequence 011110, and escapes these sequences in the data by inserting a 0-bit after every three consecutive 1-bits. As the sender, if you want to send the data bits 011001110011110, how many 0-bits (escape bits) do you need to insert?

    A. 0

    B. 1

    C. 2

    D. 3

End of exam