Unit 2 - Overview of Cellular Evolution and Wireless Technologies

Assignment 1

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2019-08-14, 23:59 IST.

1) Consider a band-limited music signal with bandwidth 16 KHz. Assuming Nyquist sampling and subsequent quantization to 16 bits per sample, the data rate of the sampled and quantized stream will be — *1 point*

- 256 kbps
- 512 kbps
- 32 kbps
- None of the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
512 kbps

2) For an analog signal with bandwidth 10 kHz, the Nyquist sampling rate will be — *1 point*

- 20000 samples/sec
- 10000 samples/sec
- 40000 samples/sec
- None of the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
20000 samples/sec

3) Consider a cellular signal with carrier frequency f_c=1800 MHz. Compute the maximum Doppler frequency f_D if the transmitter is moving at 72 kmph. — *1 point*

- 432 Hz
- 60 Hz
- 120 Hz
- None of the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
120 Hz

4) Multipath delay spread is the difference in time of arrival of the first and last copy of the signal generated due to multipath propagation. If we consider a two component multipath environment and the difference in the path length traversed by the two paths is 900m, then the time difference between the two multipath components will be — *1 point*

- 30 μsec
- 10 μsec
- 3 μsec
- Cannot be computed without specifying the carrier frequenc

No, the answer is incorrect.
Score: 0
Accepted Answers:
3 μsec

5) A cellular signal is transmitted at a power level of 2 W. The power level in dBW and dBm are: — *1 point*

- 0 dBW and 30 dBm
- 3 dBW and 33 dBm
- 2 dBW and 32 dBm
- None of the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
3 dBW and 33 dBm

6) If a WCDMA cellphone has a front-end receiver bandwidth of 10 MHz, and a Noise Figure F=3 dB, the receiver Thermal Noise floor in dBm is — *1 point*

- -101 dBm
- -131 dBm
- -99.2 dBm
- None of the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
-101 dBm

7) If a cdma 2000 radio has a receiver thermal noise floor -134 dBW, and the receiver sensitivity is -100dBm, then minimum signal-to-noise ratio to detect a signal is — *1 point*

- 34 dB
- 4 dB
- 8 dB
- Insufficient data

No, the answer is incorrect.
Score: 0
Accepted Answers:
4 dB

8) A cellular system is designed for a receiver sensitivity of -102 dBm. If the total path loss permitted is 112 dB, and a fading margin of 20 dB, for a transmit power of -5dBW, the minimum receiver antenna gain must be — *1 point*

- 5 dB
- 5 dBm
- 35 dB
- None of the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
5 dB

9) Consider an IoT system with data rate 25.6 Kbps (using QPSK modulation) and GSM which uses GMSK (binary modulation) signaling rate 270.833 Kbps. Assuming the same transmitted power, and receivers with same Noise Figure. Estimate the difference in E_b/N_0 of the two systems — *1 point*

- GSM system is better by 21.2 dB
- IoT system is better by 13.3 dB
- GSM system is better by 13.3 dB
- IoT system is better by 21.2 dB

No, the answer is incorrect.
Score: 0
Accepted Answers:
IoT system is better by 13.3 dB

10) Consider an IoT system with data rate 25.6 Kbps (using QPSK modulation) and GSM which uses GMSK (binary modulation) signaling rate 270.833 Kbps. Assuming the receivers with same Noise Figure, which of the following statements is TRUE — *1 point*

- GSM system will have better E_b/N_0 than the IoT system
- IoT system will have better E_b/N_0 than GSM
- Insufficient information to compare E_b/N_0
- None of the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
Insufficient information to compare E_b/N_0

11) For the same battery capacity, rank the following devices in terms of longest battery life to the shortest battery life (indicate the reasons): A) 2-way Long Range IoT device (Rx and Tx, low rate) B) cordless telephone C) Cellular phone D) one-way communications device (Rx only) (Hint: Transmit power depends on data rate and range) — *1 point*

- A, B, D, C
- D, A, B, C
- A, D, B, C
- None of the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
D, A, B, C

12) A cellular phone has a 3000 milli-Amp-hour (mAH) battery. Assume that the cellular phone draws 9 mA in idle mode and 900 mA during a call. Approximately how long would the battery last if no call is made? — *1 point*

- 3.3 hours
- 333 hours
- 100 hours
- None of the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
333 hours

13) A cellular phone has a 3000 milli-Amp-hour (mAH) battery. Assume that the cellular phone draws 9 mA in idle mode and 900 mA during a call. What is the approximate maximum possible talk time? — *1 point*

- 2 hours
- 8 hours
- 3.33 hours
- Insufficient data

No, the answer is incorrect.
Score: 0
Accepted Answers:
3.33 hours

14) A cellular phone has a 3000 milli-Amp-hour (mAH) battery. Assume that the cellular phone draws 9 mA in idle mode and 900 mA during a call. What is the approximate battery life (in hours) if the user makes a 5-min call every 3 hours ? (Hint: Compute the average current drawn from battery) — *1 point*

- 88.9 hours
- 3.3 hours
- 100 Hours
- None of the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
88.9 hours

15) A cellular phone has a 3000 milli-Amp-hour (mAH) battery. Assume that the cellular phone draws 9 mA in idle mode and 900 mA during a call. What is the approximate battery life (in hours) if the user makes a 5-min call every hour ? (Hint: Compute the average current drawn from battery) — *1 point*

- 40 hours
- 3.3 hours
- 36 hours
- None of the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
36 hours

16) Consider three cellular systems, wherein the signal bandwidth for each system is indicated within brackets - GSM (200 KHz), CDMA2000 (1.25 MHz) and WCDMA (5 MHz). Assuming that the base-stations transmit at same power over the same distance, and that thermal noise is the only impairment. Which of the following statements is TRUE about the carrier-to-noise ratio (C/N) (signal power / noise power). — *1 point*

- WCDMA has best (C/N)
- CDMA2000 C/N better than GSM C/N by 7.95 dB
- GSM C/N better than WCDMA C/N by 14 dB
- None of the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
GSM C/N better than WCDMA C/N by 14 dB

17) The GSM slot and frame structure are given in Slide 38 of handout. A user gets assigned one time slot per frame. It was shown in the lecture that if a User is assigned one timeslot, the achieved data rate is 22.8 kbps. What would be the user data rate if the 6 tail bits were converted to data symbols (in addition to the regular (114 bits) data fields)? — *1 point*

- 24 kbps
- 21.6 kbps
- No change in data rate
- None of the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
24 kbps