EEEN 464 – DIGITAL COMMUNICATION

CHANNEL CODING – TEST YOUR KNOWLEDGE

PART 1: TRUE/FALSE QUESTIONS

1. Channel coding primarily aims to compress data.
   Answer: False
2. Parity check codes can correct single-bit errors.
   Answer: False
3. Hamming distance is the number of bit positions where two codewords differ.
   Answer: True
4. ARQ (Automatic Repeat Request) requires a feedback channel.
   Answer: True
5. Convolutional codes are a type of block code.
   Answer: False
6. Interleaving converts burst errors into random errors.
   Answer: True
7. CRC codes are exclusively used for error correction.
   Answer: False
8. A code with minimum distance dmin=3$d$min=3 can detect 2 errors.
   Answer: True
9. Coding gain reduces the required SNR for a target bit error rate (BER).
   Answer: True
10. Turbo codes are designed only for error detection.
    Answer: False

PART 2: MULTIPLE CHOICE QUESTIONS

1. **What is the primary goal of channel coding?**
   A) Data compression
   B) Error detection/correction
   C) Encryption
   D) Signal modulation
   Answer: B
2. **Which error type is caused by short-duration disturbances (e.g., lightning)?**
   A) Random errors

B) Burst errors
C) Single-bit errors
D) Parity errors
Answer: B

3. **In a single parity check code, if data =** 1101 **(even parity), the parity bit is:**
   A) 0
   B) 1
   C) Cannot be determined
   D) 2
   Answer: A (Sum=3, odd → parity=1 for even total? Wait, even parity: total 1s must be even. Data has 3 ones (odd), so parity bit should be 1 to make total even. Correction: **B**)

4. **Hamming distance between** 101010 **and** 100100 **is:**
   A) 1
   B) 2
   C) 3
   D) 4
   Answer: C (Positions 3, 5, 6 differ)

5. **A code with dmin=5*d*min=5 can correct up to:**
   A) 1 error
   B) 2 errors
   C) 3 errors
   D) 4 errors
   Answer: B (t=⌊(5−1)/2⌋=2*t*=⌊(5−1)/2⌋=2)

6. **Which code is a linear block code?**
   A) Convolutional code
   B) Hamming code
   C) Turbo code
   D) LDPC code
   Answer: B

7. **Interleaving helps mitigate:**
   A) Random errors
   B) Burst errors
   C) Both
   D) Neither
   Answer: B

8. **ARQ is most efficient in:**
   A) High-reliability channels
   B) Low-latency channels
   C) Channels with feedback
   D) Bandwidth-limited channels
   Answer: C

9. **CRC detects errors using:**
   A) Parity bits
   B) Polynomial division
   C) Hamming distance

D) Interleaving
Answer: B

10. **For a (7,4) Hamming code, the number of redundant bits is .....**
    A) 3
    B) 4
    C) 7
    D) 11
    Answer: A

11. **FEC (Forward Error Correction) is used when .....**
    A) Feedback is unavailable
    B) Latency must be minimized
    C) Both A and B
    D) Neither A nor B
    Answer: C

12. **Constraint length in convolutional codes refers to .....**
    A) Code rate
    B) Memory length + 1
    C) Block size
    D) Minimum distance
    Answer: B

13. **Which code achieves near-Shannon-limit performance?**
    A) Parity code
    B) Hamming code
    C) Turbo code
    D) Repetition code
    Answer: C

14. **The syndrome in block codes is used for .....**
    A) Error detection
    B) Error correction
    C) Both A & B
    D) Neither A & B
    Answer: C

15. **A systematic code .....**
    A) Has parity bits appended to data
    B) Scatters parity bits
    C) Only detects errors
    D) Requires feedback
    Answer: A

16. **Coding gain is measured in .....**
    A) Bytes
    B) Hertz
    C) Decibels (dB)
    D) Seconds
    Answer: C

17. **Repetition codes are inefficient because they .....**
    A) Have low code rates
    B) Cannot correct errors
    C) Cause burst errors
    D) Require feedback
    Answer: A

18. **In stop-and-wait ARQ, the sender .....**
    A) Transmits continuously
    B) Waits for ACK/NACK
    C) Ignores errors
    D) Uses interleaving
    Answer: B

19. **The minimum distance for a code correcting *t* errors must be:**
    A) $d_{min} \geq t$
    B) $d_{min} \geq 2t$
    C) $d_{min} \geq 2t+1$
    D) $d_{min} \geq t+1$
    Answer: C

20. **Example of an error-detecting code .....**
    A) (7,4) Hamming code
    B) Convolutional code
    C) CRC-32
    D) Turbo code
    Answer: C