1. OSI Reference model layer for the following concepts -

  CSMA/CD - Layer 2 (data link)
  Manchester encoding - Layer 1 (physical)
  Internet protocol - Layer 3 (network)
  HTTP - Layer 7 (application)

— * —.

2. Ethernet uses CSMA/CD
  * CSMA/CD (carrier sense multiple Access with collision detection)
  * It allows host to whether or not a line is idle before sending (CSMA) and then detect collisions (CD). Aloha hosts didnot have this capability.
  * Aloha had guaranteed collisions which made it very inefficient.

— * —.

3. * CSMA uses exponential backoff after a collision is detected.
  * It is used in Ethernet.
  * If a collision occurs after 2 hosts try to transpant, hosts wait some time (determined by exp backoff) and the try transmitting again.
  * CSMA/CA uses exp backoff before a collision occurs (in an attempt to avoid collisions completely)
  * It is used in wireless (802.11). When a collision is inferred, hosts wait for some number of idle (time slots) (determined by exp backoff so pass before trying to send.
  * exponential backoff ⇒ first time: wait 0 or 1 min frames time at random, retry ≫ second time: wait 0, 1, 2, 3 times ≫ Nth time ($N <= 10$): wait $0, 1, \ldots 2^N - 1$ times ≫ Max wait 1023 frames, give up after 16 attempts

— * —.

4. (a) Degree of CRC polynomial $\Rightarrow 4$

(b) the generator polynomial $G(x) = x^4 + x + 1$

=> 10011 => 5 bits

∴ Appended CRC code could be the lost 4 bits of the stream.

=> CRC = 1110

Data = 110 10 110 11 ≅ 6

∴ Data when appended with 4 (0's) give

=> 1101011011 0000 ≅ a.

= * =

5. Comparision b/w Aloha and Slotted Aloha.

Aloha	Slotted Aloha
In this Aloha, any station can transmit the data at anytime	In this slotted Aloha, any station can transmit data at the beginning of any timeslot.
The time is continuous and not globally synchronized	The time is discrete and globally synchronized.
Vulnerable time for pure aloha = $2 \times Tt$	Vulnerable time for slotted aloha = Tt
The probability of successful transmission of data packet = $G \times e^{-2G}$.	The probability of successful transmission of data packet = $G \times e^{-G}$.
Maximum efficiency = 18.4%.	Maximum efficiency = ~~76.8%~~. 36.8%.
Pure aloha doesn't reduces the number of collisions to half	Slotted aloha reduces the number of collisions to half and reduces the efficiency of pure aloha.