



2. In Gigabit Ethernet mechanism:

2 a) How does "Carrier Extension" work? (5 marks) Please explain with its frame format.

2 b) Why does Gigabit Ethernet need carrier extension? (5 marks)

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3. When Gigabit Ethernet operates in full-duplex mode, CSMA/CD (including the carrier extension and frame bursting) is disabled. It introduces link-level flow control, so called "Pause Protocol". Please explain how Pause Protocol works. (10 marks) Please draw a flowchart for this mechanism.

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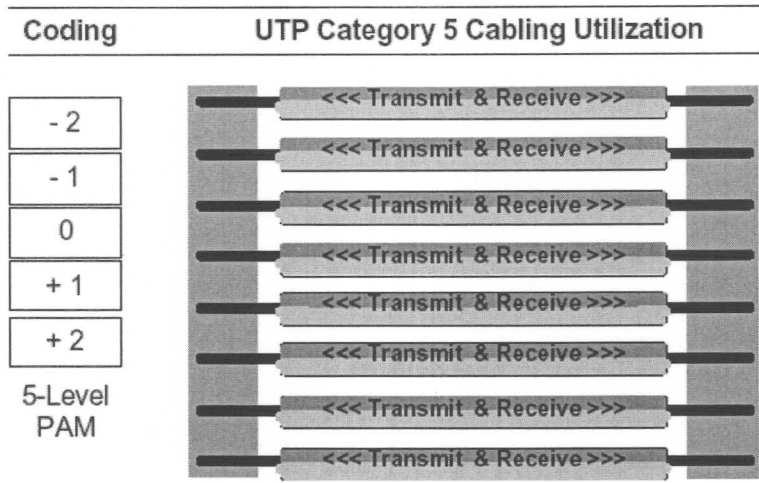
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4. The below picture is 1000BASE-T using UTP Category 5. Please explain how Gigabit Ethernet can work out 1 Gbps speed on this cable. (10 marks)

### 1000BASE-T



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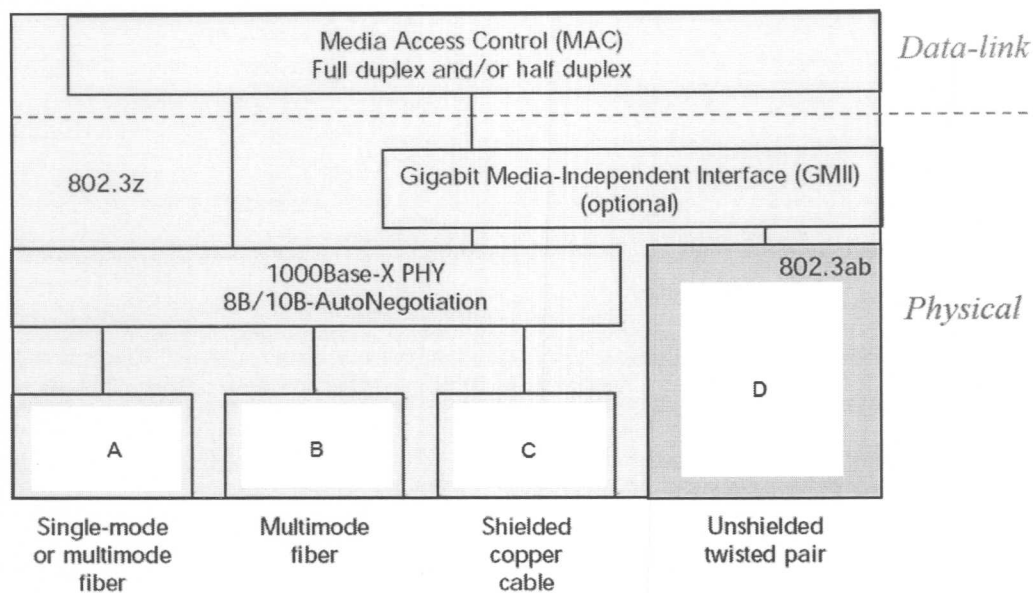
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5. Below is Gigabit Ethernet Protocol Architecture. What are A, B,C, and D? (10 marks)



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6. The table below is a comparison between 1000Base-T and 10GBase-T. What are A, B, and C? (10 marks)

1000BASE-T	10GBASE-T
5-level coded PAM signaling (2 information bits/symbol)	A
8-state 4D Trellis code across pairs	8-state 4D Trellis code across pairs
Full duplex echo-cancelled transmission	B
125 Mbaud, ~80 MHz used bandwidth	833 Mbaud, ~450 MHz used bandwidth
No FEXT Cancellation	C

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7. 10G uses 4 pairs of each cable (same as 1000BASE-T). The encoding uses 3 information bits per symbol (baud) with baud rate: ~ 833 MBaud. Please explain how 10G can achieve 10 Gbps. (10 marks)

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8. The table below is a comparison between 1000Base-T and 10GBase-T What are A, B, and C?

Feature	Gigabit Ethernet	10 Gigabit Ethernet
IEEE standard	802.3z	802.3ae
Media support	Copper and optical fiber	Optical fiber
Mode(s) of operation	Half and full duplex	(A)
Coding scheme	(B)	64B/66B
PMD layer	From fiber channel	New
Transmission range	5 km	40 km
SONET/SDH attachment	(C)	Yes

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9. Figure below show 10G Ethernet Protocol Architecture (in IEEE 802.3ae). What are A, B, and C?



(A)

(B)

(C)

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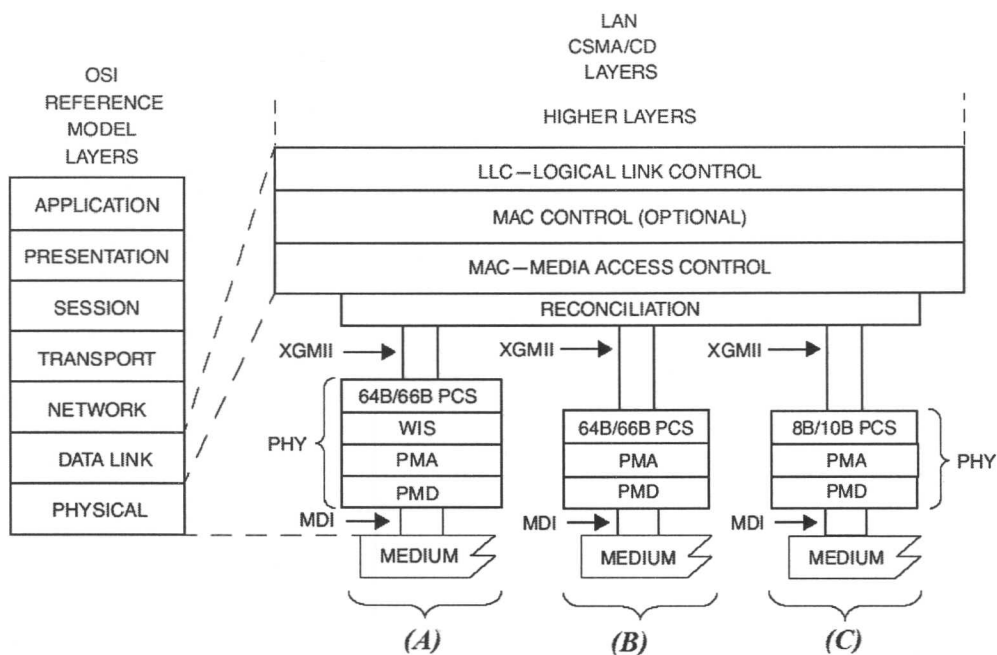
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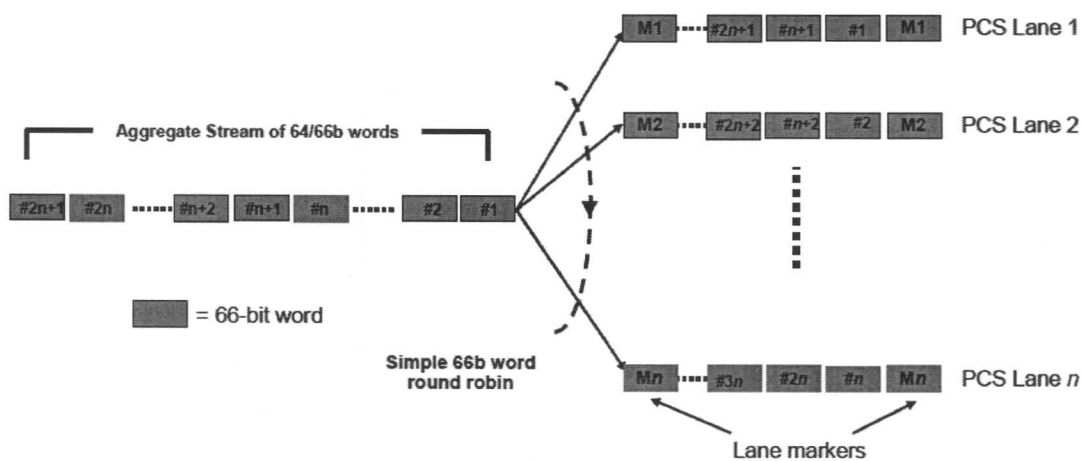
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10. In 100 G Ethernet, it provides “Multilane Distribution (MLD). The MLD scheme implemented in the PCS is fundamentally based on a striping of the 66-bit blocks across multiple lanes. Please explain, how 100 G Ethernet can achieve 100 Gbps.



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