

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

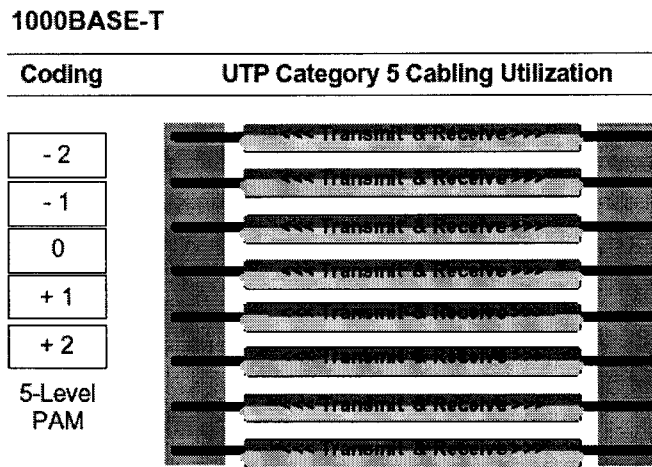


Figure 1 1000based-T cables and signals layout

Answer

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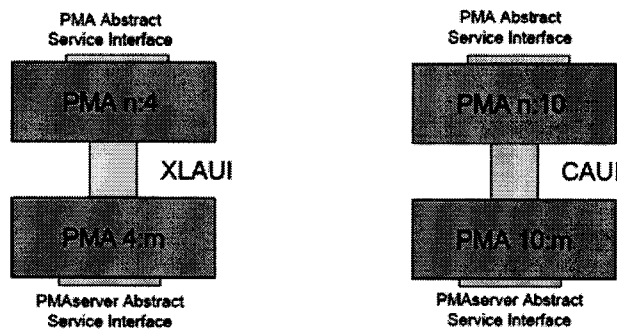
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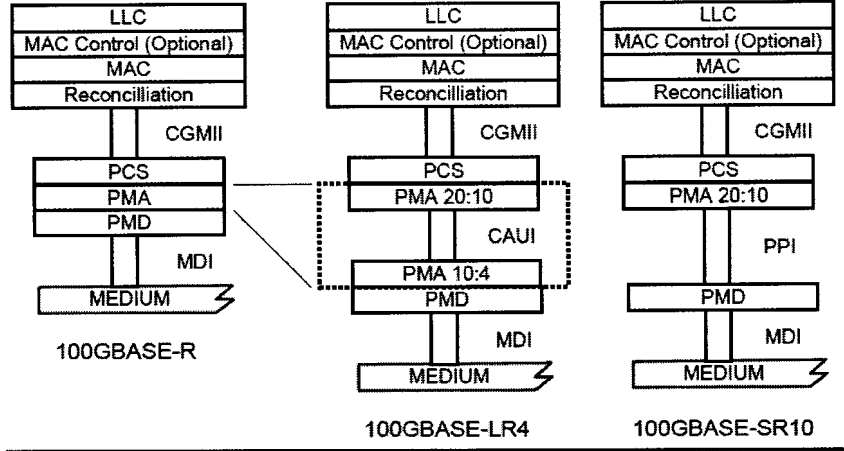
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- 4 In (a) it shows the 40 Gigabit Ethernet and 100 Gigabit Ethernet Protocol Architectures. Please explain how each works, show their differences of traffic lanes mapping (10 marks). In (b), it is a sample usage of the mapping scheme for 100 Gbps, please explain how it works (10 marks).



(a) Mapping scheme of 40G and 100G Ethernet



(b) a sample use for 100 Gbps Ethernet

Answer:

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5 The table below is a comparison between 1000Base-T and 10GBase-T. What are A, B, and C? (5 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

Answer

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6 10G uses 4 pairs in 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)

Answer

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7 The table below is a comparison between 1000Base-T and 10GBase-T What are A, B, and C? (5 marks)

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

Answer

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- 8 In 100 G Ethernet, “Multilane Distribution (MLD)” is used. 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. (5 marks)

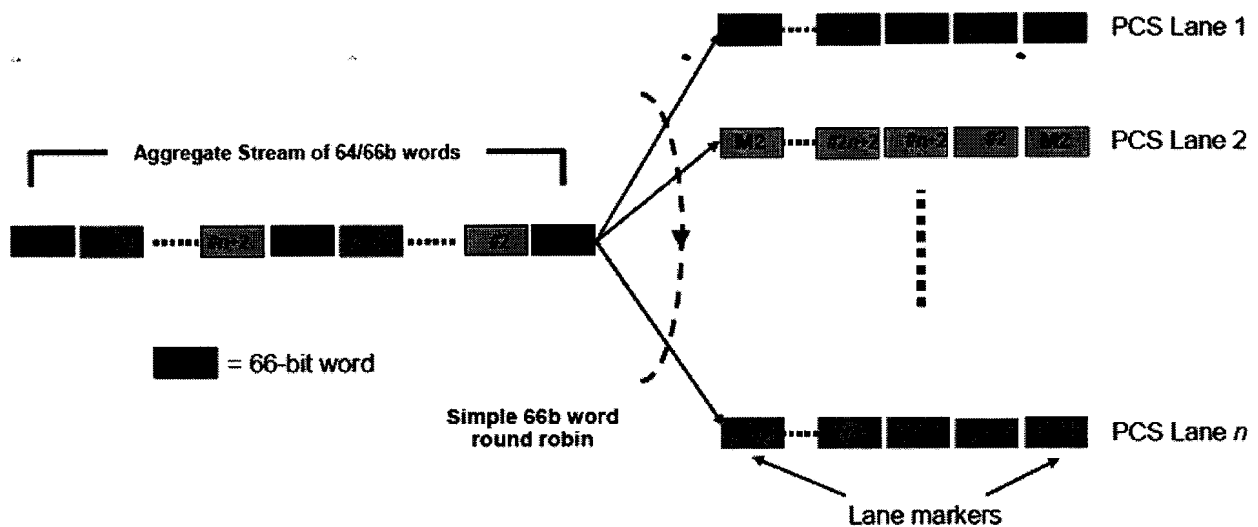


Figure 2 Multilane Distribution (MLD) of 100 Gbps Ethernet

Answer

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- 9 The picture below shows a multiplexing PCS lanes to physical media. Please explain how it works which is a sample of how to multiplex VLANs. (10 marks)

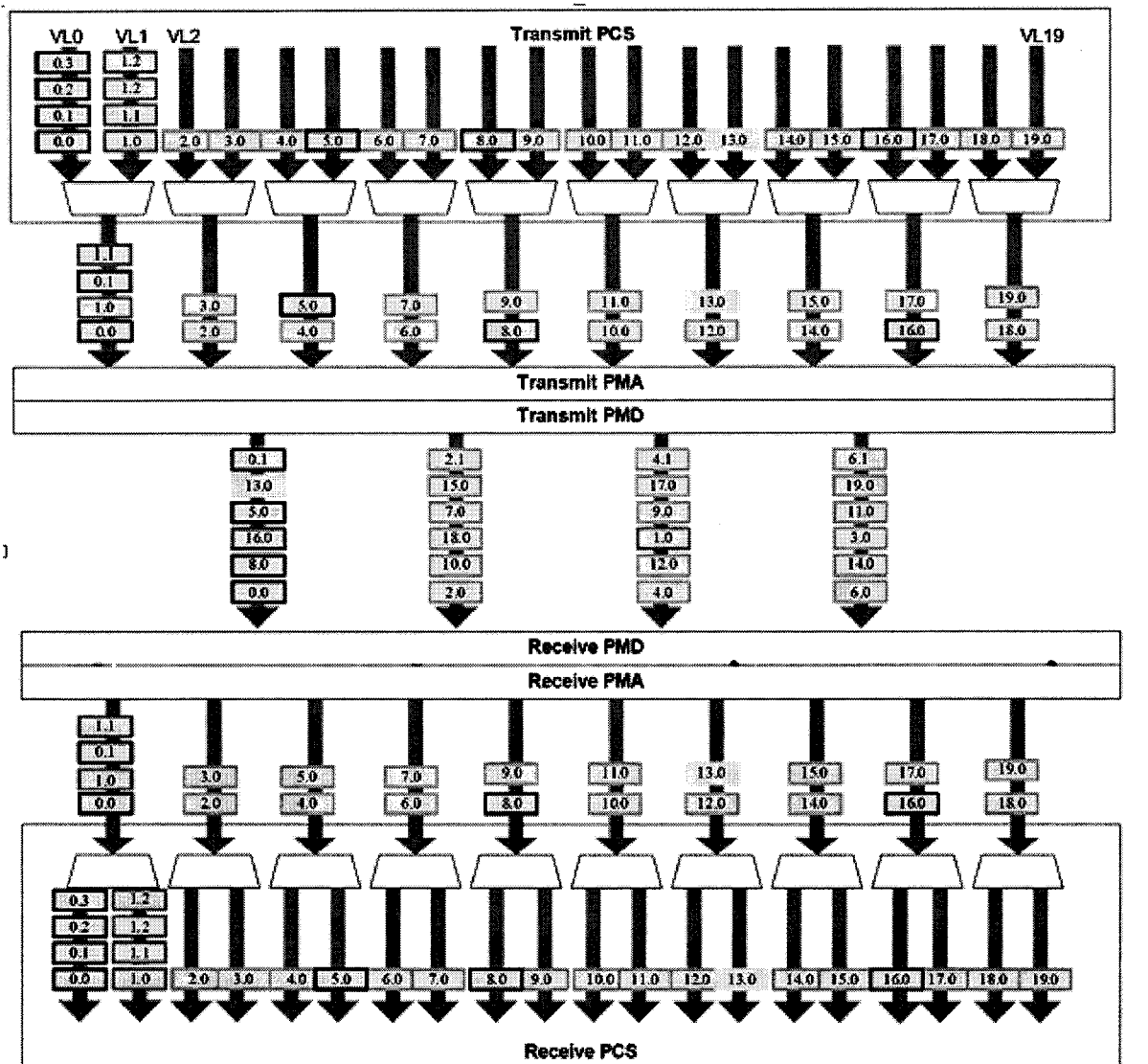


Figure 3 a multiplexing PCS lanes to physical media.

Answer

11. Unshielded twisted pairs are used for x-based T Ethernet. The signal level can be improved by reducing some crosstalk effects. Below are 2 crosstalk schemes that are wellknown, and can be eliminated. Please explain of each crosstalk happens (10 marks).

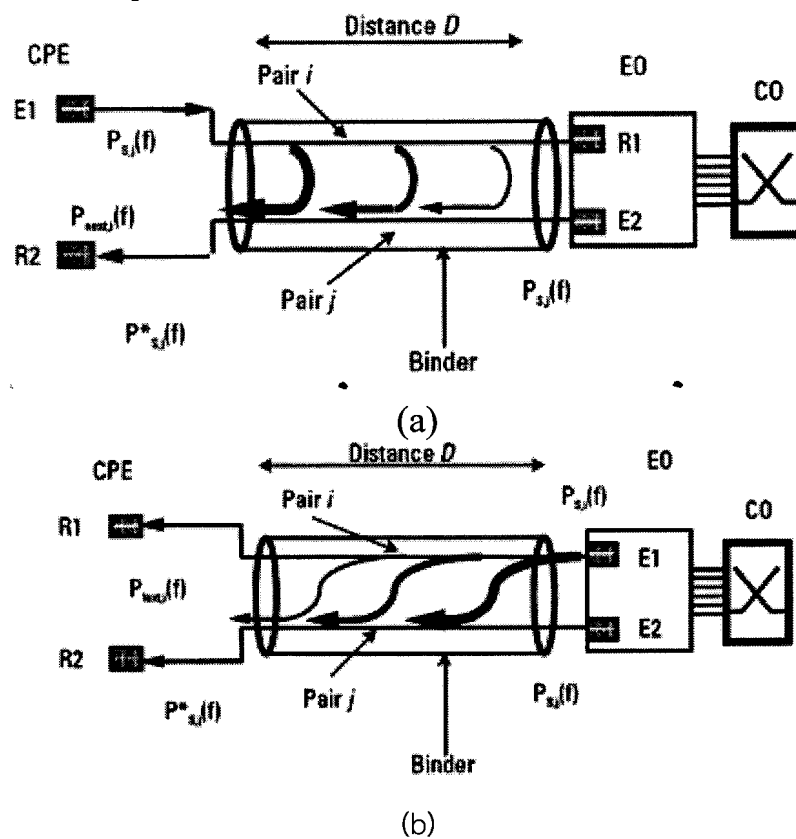


Figure 4 Crosstalk effects

Answer

12. Variable Bit Rate (VBR) (10 marks)

The figure below shows how to derive VBR parameters where:

T_s is the average cell arrival rate ($T_s = 9$)

T is the peak cell rate ($T = 3$)

τ_s is the burst tolerant

S is the size at peak

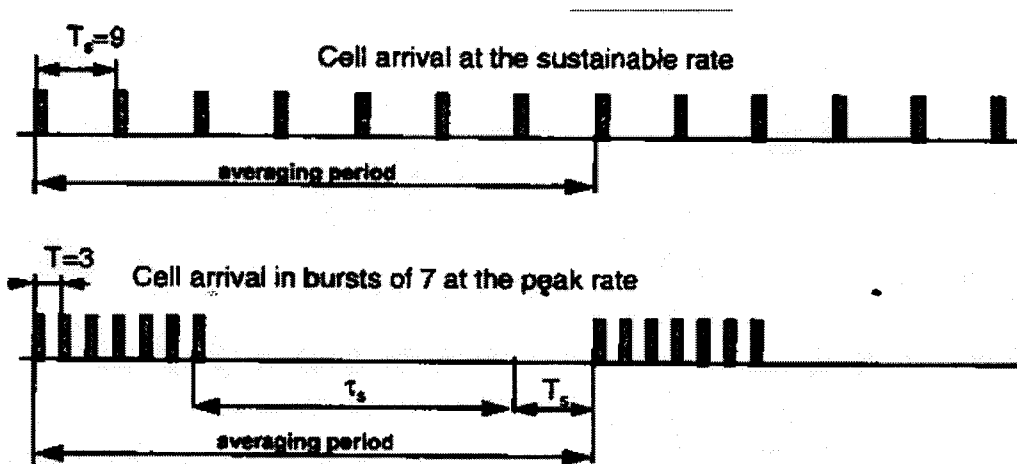


Figure 5 for question no. 12

From Figure 5, please find the Maximum Burst Size (MBS) that can be transmitted at the peak rate and still be in conformance with the GCRA (T_s , τ_s), according the parameters given above.

Answer

