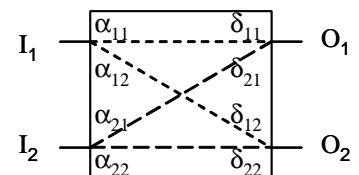


## Course S-38.3165 (Switching Technology) exam questions, March 6, 2006

1. Answer the following questions concerning the transport systems.
  - a.) Why is line coding applied on the transport links?
  - b.) What methods are used in synchronous transport networks for frame alignment?
  - c.) What methods are used in asynchronous transport networks for frame alignment?
  
2. Answer the following questions related to routing and routers.
  - a.) Why do switching devices (routers) of the packet switched networks implement larger buffers than switching devices of the circuit switched networks?
  - b.) Why was Classful Address Mechanism replaced by Classless InterDomain Routing (CIRD) mechanism?
  - c.) What methods are used to speed up routing decision in IP routers?
  
3. The switch fabric of a telephone exchange is constructed of SRAM memories in such a way that the fabric implements a separate Switch Memory (SM) and Control Memory (CM). The exchange is connected to the public telephone network via 32 E1 lines.
  - a.) What is the minimum size of SM and CM?
  - b.) What is the required (read/write) speed of the memories?
  - c.) What is the number of phone calls through the exchange during a busy hour if the total voice traffic through the exchange is 640 Erlangs and the average call duration is 4 minutes?
  
4. What are the crosspoint count, logical depth and fanout of the following switches?
  - a.) NxN crossbar
  - b.) Strict-sense non-blocking NxN Clos network. The 1st and 3rd switching stages are constructed of 2x2 crossbars and the 2nd stage of (N/2)x(N/2) crossbars.
  - c.) NxN Benes network.

5. You have an optical 2x2 LDC (Linear Divider-Combiner) switching component.



- a.) Suppose that you use the component as a 2x2 "broadcast star" switch. The optical signal power at input  $I_1$  is twice the signal power at input  $I_2$  and both outputs have an equal optical signal power. Determine the power transfer coefficients ( $\alpha_{ij}$  and  $\delta_{ij}$ ) and use them to form the power transfer matrix ( $\mathbf{P}_o = \mathbf{A}\mathbf{P}_i$ ). Assume that there is no power loss in the component.
  
- b.) If a 4x4 optical switch is to be built up by using the above type of components, then how many components are needed and what are the physical connections between them. Show by a drawing the structure of the switch and include in the drawing connections of the given switching table.

	O1	O2	O3	O4
I1		x		
I2	x			
I3				x
I4			x	