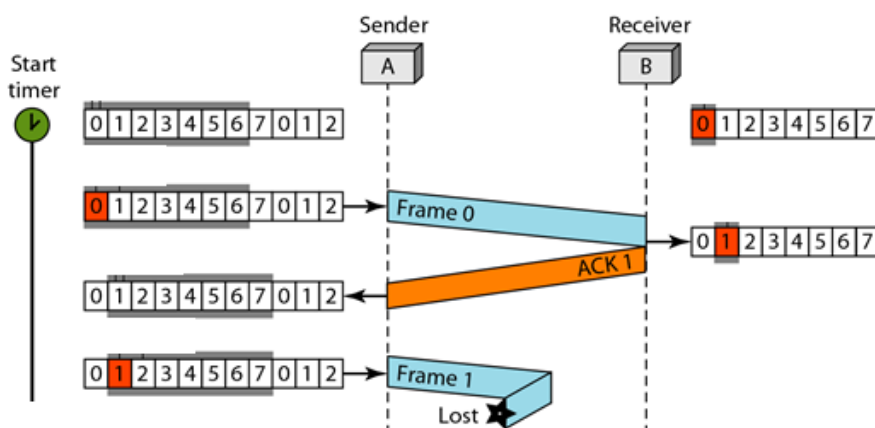


- **Only handwritten** answers accepted (Paper typed in Word Format will not be marked)
- Write your **ID on every page** of answer sheets
- Write Question No., Part No., Question and then start answer e.g. Q1 (a) Which layers...
- Before submitting check your Document file is arranged sequentially e.g. Page No. 1, 2, 3, 4...
- Submit your answers in PDF format. Your file name will be your ID\_Student name. e.g. 12345\_IrfanUllah.pdf

**Q1.** We need a three-stage space-division switch with  $N = 200$ . We use 25 crossbars at the first and third stages. **10 marks**

- . What is the number of crossbars at middle stage so that every mid-stage crossbar has equal inputs and outputs.
- . Draw the configuration diagram and calculate the total number of cross points.
- . Calculate the total number of cross points using Clos Criteria.

**Q2.** Explain and show graphically what will happen when Frame 1 is lost using Selective-Repeat ARQ. **7 marks**



**Q3.** A digitized voice channel is made by digitizing a 4-kHz bandwidth analog voice signal. We need to sample the signal at twice the highest frequency. We assume that each sample requires 16 bits. What is the required bit rate? **8 marks**

**Q4.** An ISP is granted a block of addresses starting with 10.100.10.0/16. **15 marks**

The ISP needs to distribute these addresses to three groups of customers as follows:

- . The first group has 64 customers; each needs 128 addresses.
- . The second group has 128 customers; each needs 128 addresses.
- . The third group has 128 customers; each needs 32 addresses.

. Design the sub blocks and find out how many addresses are still available after these allocations.

**Q5.** Below shows a part of an internet with two routers connecting three LANs. Each device (computer or router) has a pair of addresses (logical and physical) for each connection. Each router, however, is connected to three networks (only two are shown in the figure). So each router has three pairs of addresses, one for each connection. Using the figure below fill in the missing information. Also explain each step.

