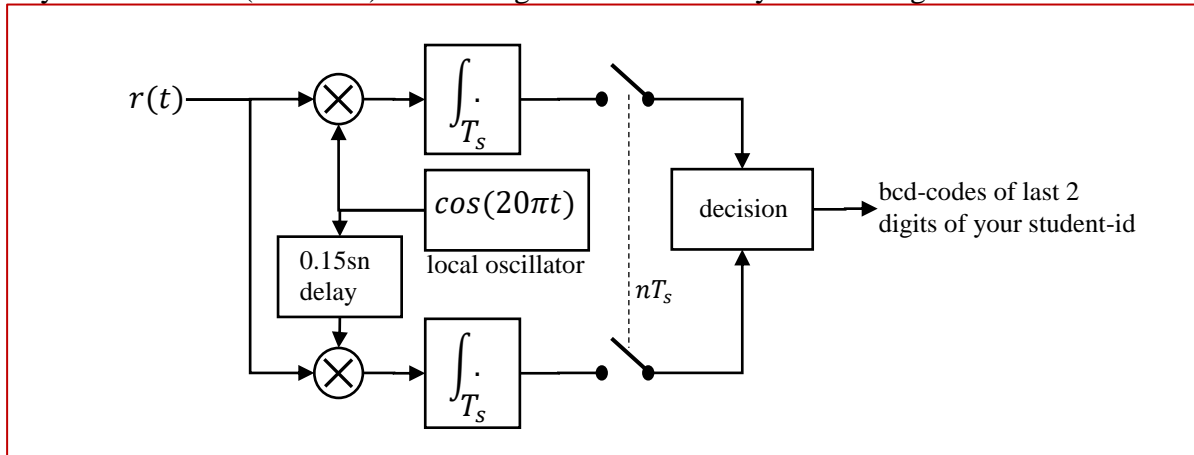


Upload until : 10:55

The following quadrature receiver is given. The oscillator in the receiver is in perfect sync with the in-phase component of the received signal $r(t)$. Symbol period is 0.2s. Draw the incoming QPSK waveform in order for the receiver to output bcd-codes of the last two digits in your student-id (msb-first). Put timing marks/values on your drawing.



Put your answer **in the** drawing-canvas below. **Do not** change anything else except putting your name/id on top of the page.

Answer:

It is impossible to obtain the required binary stream since the receiver does not generate quadrature carriers;
 Delayed signal is not orthogonal to signal generated by the local oscillator;
 Local oscillator output : $\cos(20\pi t)$
 0.15s delayed signal : $-\cos(20\pi t)$
 Therefore, the second correlator output is just the negative of the first one.

Upload your answer (word or pdf) before 10:55. **No e-mails** will be accepted.

Added: In order to be able to give points to the students who tried to solve the problem with the assumption that the receiver generates quadrature carriers (even though a constellation diagram is not given), the following miss-solution is added with an assumed QPSK constellation. Note that this answer is not correct for the question, therefore a maximum of 10 points is given.

An example constellation look-up table would have been like;

Symbol	I	Q	waveform
00	1	0	cos
01	0	1	sin
10	0	-1	-sin
11	-1	0	-cos

Let us assume that your student id ends with 49, which is 01001001 in bcd.

The symbol sequence is then 01-00-10-01 corresponding to {sin,cos,-sin,sin} sequence.

Since the carrier frequency is 10 Hz and the symbol period is 0.2s, we have two periods of carrier per symbol.

