PROJECT INSTRUCTIONS

1) This is an **team** project, teams can be composed of $2-4$ students.
2) All team members are accountable for all project parts.
3) Team reports (including source codes, figures or comments) are not to be shared with others, neither before nor after submission. However, in person discussions are encouraged.
4) Any copied reports, either fully or partially, will receive 0 points. This applies to both the original and the copy.
5) No late submissions are allowed.
6) In submission, you have to submit **.m files** separately. In addition, the figure should be submitted in **.fig format** and should be **included** in the **.pdf report**. Reports should be comprehensive and readable on their own.
7) The **.pdf report** is the main document to be evaluated, *i.e.* no credit is given for the source codes. However, source codes are to be checked against plagiarism.
8) Grading will depend on:
   - **40%**: Completeness and correctness of every deliverable (as per the .pdf report)
   - **40%**: Clarity of figures, and proper labeling (as per the .pdf report)
   - **20%**: Report writing and organization

PART A: USING MATLAB

1) Generate the message signal $m(t)$, shown in Fig. 1, and plot it.

2) Generate the phase deviation signal, $\theta(t)$, and **plot** it.

$$\theta(t) = 2\pi K_f \int_0^t m(\tau)d\tau, \quad \text{for } K_f = 1000$$

3) Generate an FM signal with $\theta(t)$ using a carrier wave of 1 Volt amplitude and 10 KHz frequency. **Plot the FM signal** and **comment** on it.
4) Repeat the previous steps for $K_f = 3000$ and $K_f = 5000$. Comment on the plots you obtain.

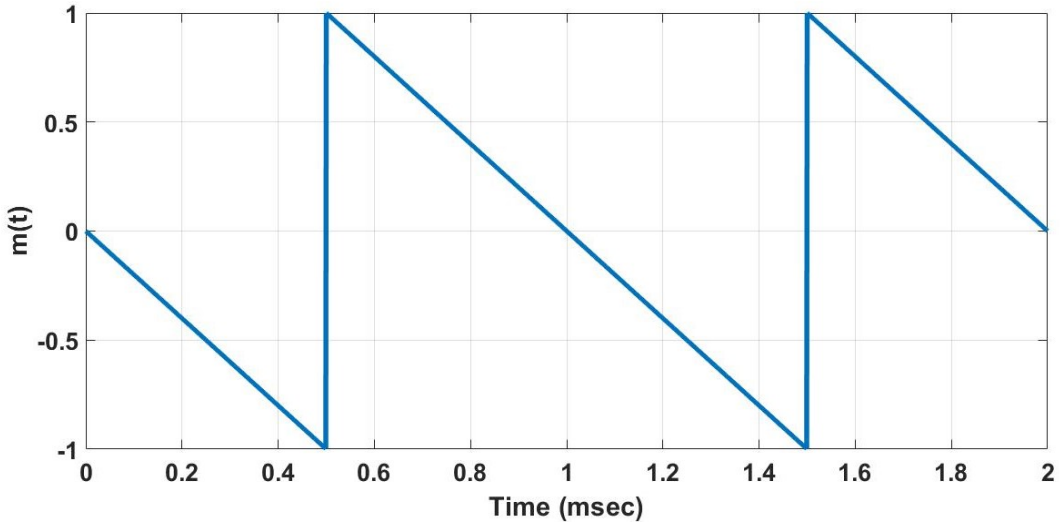

Fig. 1: Information signal $m(t)$

Deliverable - Part A

Deliver, electronically, the following in a .zip file

1) Source codes (**.m files**) to generate the required signals.
2) Figure plots (**.fig files**) of the required signals.
3) A **.pdf file** of a complete report, including the figures, properly labeled and titled. The report should also include your comments.

PART B: USING SIMULINK

In this part, you are required to use Simulink in conjunction with the Matlab workspace.

1) Repeat Part A using Simulink.
   Hints:
   - Use **simin** block to use the message signal defined in your workspace.
   - Use a multi-input scope to show the message signal, the phase deviation signal and the modulated signal on the same graph.
2) Repeat step 1 for an input sinusoidal message signal, $n(t)$, with an amplitude of 1.5 volts and a frequency of 2 KHz.

Deliverable - Part B

Deliver, electronically, the following in a .zip file

1) **Block diagram** of your system in Simulink.
2) **Parameters** of each block used in the system.
3) **Scope outputs** for triangular and sinusoidal message signals.
4) A **.pdf file** of a complete report, including the figures, properly labeled and titled. The report should also include your comments.

PART C: USING SIMULINK TOOLBOXES

Using the **FM Modulator** block from **Communications** toolbox, verify your findings from Part B.

Deliverable - Part C

Deliver, electronically, the following in a .zip file

1) **Block diagram** of your system in Simulink.
2) **Parameters** of each block used in the system.
3) **Scope outputs** for triangular and sinusoidal message signals.
4) A **.pdf file** of a complete report, including the figures, properly labeled and titled. The report should also include your comments.