Assignment -2
Signals & Systems: ECE250
Monsoon-2023

Release: 1-Sep-2023 (6:15 PM) **Submission: 9-Sep-2023 (6:15 PM)**

Instructions

- **Institute Plagiarism Policy Applicable.** This will be subjected to strict plagiarism check.
- This assignment should be attempted individually.
- A maximum point for this assignment is **50**. All questions are compulsory.
- **Theory Problems:** Submit a hard copy of your solutions in the wooden box kept on the 3rd Floor of Old Academic Block (right side of the lift). Write your Name, Roll No. on the hard copy of your solutions.
- **Programming Problems:** Use Matlab/Python to solve the programming problems. For your solutions, you need to submit a zipped file on Google classroom with the following:– program files (.m) with all dependencies.– a report (.pdf) with your coding outputs and generated plots. The report should be self-complete with all your assumptions and inferences clearly specified. Submit a *.zip* file named *A1_ RollNo.zip* (e.g., *A1_PhD22100.zip*). Codes/reports submitted without a zipped file or without following the naming convention will NOT be checked.
- **Submission Policy:** Expect **No Extensions**. Late submissions will not be evaluated and hence will be awarded zero marks strictly.
- **Clarifications:** Symbols have their usual meaning. Assume the missing information & mention it in the report. Use Google Classroom for any queries. In order to keep it fair for all, no email queries will be entertained.
- There could be multiple ways to approach a question. Please justify your answers. Questions without justification will get zero marks.

Q1: Check Linearity & Non-Linearity of the following systems with proper explanation (Law of Additivity & Law of Homogeneity both). **[5×2 Points]**

(a) y(t) = Real [x(t)]

(b) y(t) = Even [x(t)]

(c) y(t) = Sin[x(t)]

(d) y(t) = Cos(t).x(t)

(e) y(t) = Modulus [x(t)]

Q2: Draw the signal d/dt[x(t)] in the following cases. **[2×5 Points]**

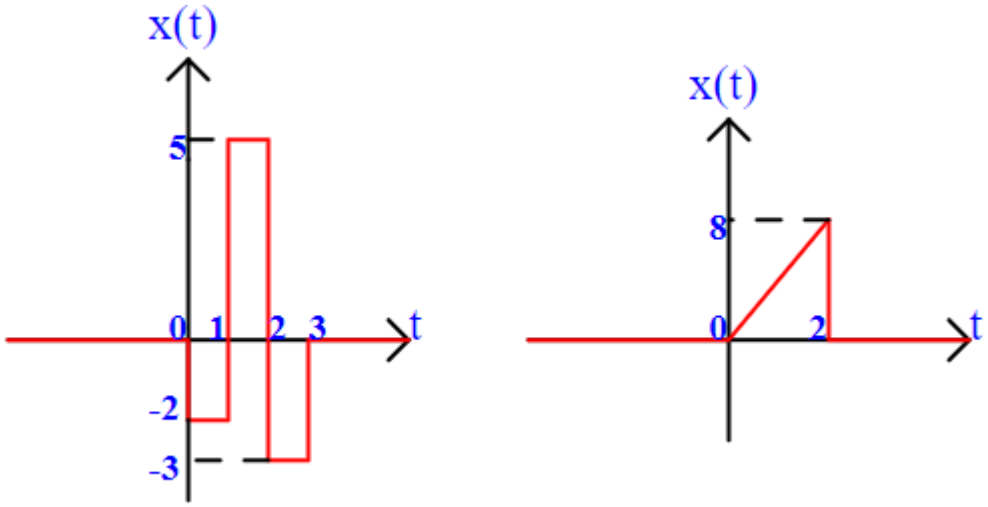

Figure 1

Q3: Draw the signal $\int_{-\infty}^{t} x(t)dt$ in the following case. **[5 Points]**

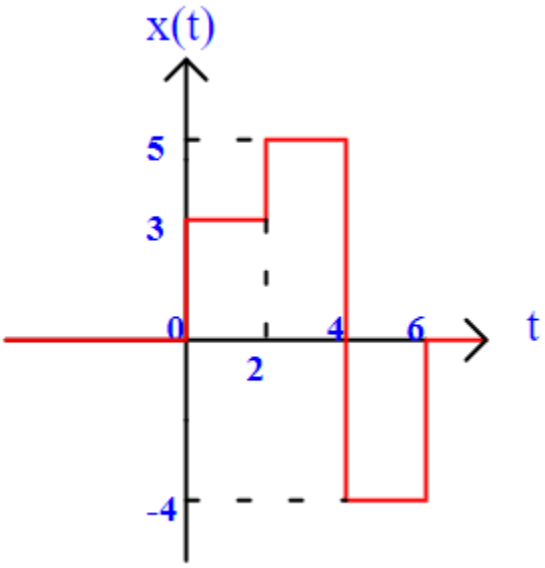

Figure 2

Q4: Check the system is Stable or Unstable (BIBO Stability) with proper explanations. **[5×2 Points]**

(a) y(t) = t.x(t)

(b) y(t) = x(t)/t

(c) y(t) = $\int_{-\infty}^{t} Cos(\tau).x(\tau)d\tau$

(d) y[n] = n^2x[n]

(e) y[n] = $\sum_{k=-\infty}^{n} x[k]$

Q5: Draw the signal Y(t) = $X_1(t) * X_2(t)$ with proper explanation, where "$*$" represent convolution. **[5 Points]**

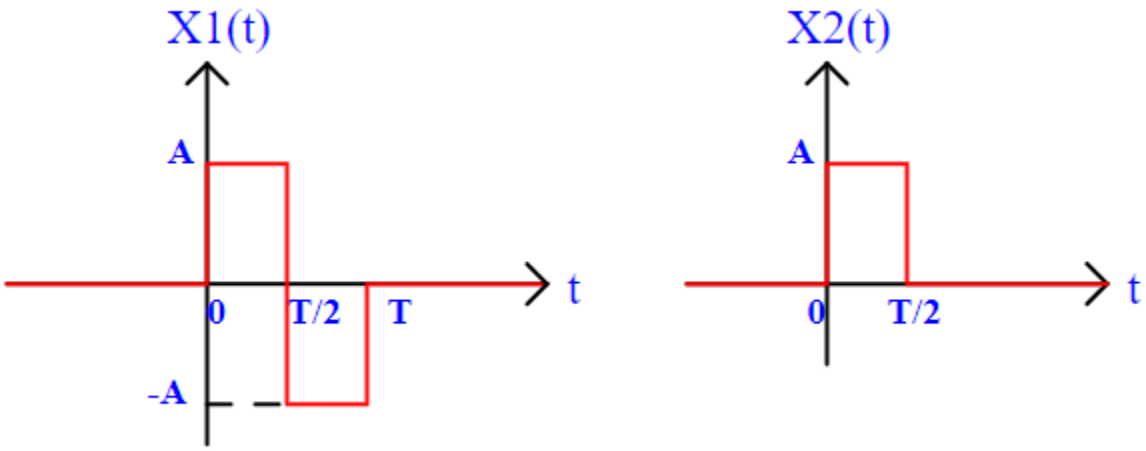

Figure 3