School of Engineering and Applied Science (SEAS), Ahmedabad University

Name: _____ Roll no.: _____

B. Tech. (Computer Science and Engineering): Semester III
ECE 210 Signals and Systems: Mid Term Exam (Monsoon Sem.:2023); Marks: 30 M, Wt.: 30 %
September 17, 2023, Sunday, 2.00 PM – 4.00 PM

Instructions:

1. **All questions are compulsory.**
2. **The question paper has only one page.**
3. **The figures to the right indicate full marks.**
4. **All acronyms carry their usual meaning.**
5. **Assume suitable data wherever necessary and specify it clearly in your answers.**
6. **Write your answers sequentially in the answerbook.**

Q1	Determine whether the following signals are periodic or not. If periodic, determine the fundamental period. a) $\cos(t) + \sin(\sqrt{2t})$ b) $x[n] = \cos\left(\frac{\pi n}{7}\right) \sin\left(\frac{\pi n}{3}\right)$	4
Q2	Show that the power of the energy signal is zero over infinite time.	3
Q3	Sketch the following signal: $x[n] = u[n+2] - 3u[n-1] + 2u[n-5]$. Find the even and odd components of $x[n]$.	4
Q4	Solve the following integral: a) $\int_{-1}^{1} \left(\frac{t^2}{2} + 5\right) \delta(t)\, dt$ b) $\int_{-3}^{-1} e^{-t}\, \delta(t)\, dt$	3
Q5	Prove the following relationship $u[n] - u[n-1] = \delta[n]$	2
Q6	Consider the following signal $u(t)$. Sketch each of the following signals: a) $u(t-2)$ b) $u(2t)$ c) $u\left(\frac{t}{2}\right)$ d) $u(-t)$	4
Q7	Check whether the following systems are Linear and Time invariant. a) $\frac{dy(t)}{dt} + ty(t) = x(t)$ b) $y(t) = x(t+10) + x^2(t)$	4
Q8	Show that for an LTI system, knowing impulse response allows finding output for any arbitrary input signal.	3
Q9	Check whether the following signal is linear and shift invariant. $y[n] = \log[x[n]]$	3