ELEC 255 tutorial. Practice 3. Continuous-Time Linear Time-Invariant Systems (II)

STUDENT #: _____ **MARKS:**_____**/25**

Problem 1: [5 marks/part]

Using the graphical method, compute the convolution of the following two signals:

$$x(t) = \begin{cases} t+2, & -2 \le t < -1, \\ 1, & -1 \le t \le 5, \\ 0, & \text{elsewhere.} \end{cases}$$

and $h(t) = e^t u(-t)$.

(a) Plot $x(\tau)$, $h(\tau)$ and $h(t-\tau)$ versus τ. ***Be very careful*** *to plot these graphs correctly. If you make a mistake here, all of your subsequent work will be completely wrong, and* ***you will lose a very substantial number of marks*** *as a result.*

(b) For each of the cases (i.e., intervals of t) to be considered in the computation of the convolution result $y(t)$, carefully sketch and fully label the graph that includes both $x(\tau)$ and $h(t-\tau)$ plotted versus τ.

(c) Use the graphs from part(b) to determine the convolution result $y(t)$. **You may state your final answer in terms of integrals.**

Problem 2: [**5 marks**]

Find the impulse response of the LTI system characterized by the equation $y(t) = \int_{t-1}^{t} x(\tau)d\tau$. The input and output of the system are denoted as $x(t)$ and $y(t)$, respectively.

Problem 3: [**5 marks**]

Use the sifting property of the unit-impulse function, in order to evaluate the integral: $\int_{-\infty}^{\infty} e^{t}\delta(-4t+5)dt$. Show all of your work. **Do not skip any steps.**