**ENGR 3324: Signals and Systems**

**Test 2 (7/11/22)**

**Time:** 11:00AM – 12:18PM **Name:**

**Q1)** Find the transfer function *H*(*s*) for the system described by the differential equation

$$\frac{d^{2}y(t)}{dt^{2}}+9y(t)=\frac{dx(t)}{dt}+x(t)$$

**Q2)** Find the zero-state response *y*zs(*t*), if the input is *x*(*t*) = 4e-3t *u*(*t*) and the system transfer function is

$$H\left(s\right)=\frac{s+3}{s^{2}+6s+8}$$

**Q3)** Find the Laplace transform *X*(*s*) of the signal *x*(*t*) shown in Fig. 1 below.

4

*x*(*t*)

*t*

Fig. 1

4e-3(t-2) *u*(*t*-2)

2

**Q4)** Draw the block diagram of Form II realization (canonic) for the system specified by the transfer function

 $H\left(s\right)=\frac{3s+2}{s^{2}+6s+9}$

**Q5**) Design a third order filter that has a magnitude frequency response shown below. Show the locations of the poles and zeros on the s-plane and find the transfer function *H*(*s*).

10

20

15

1

|*H*(j*ω*)|

*ω*