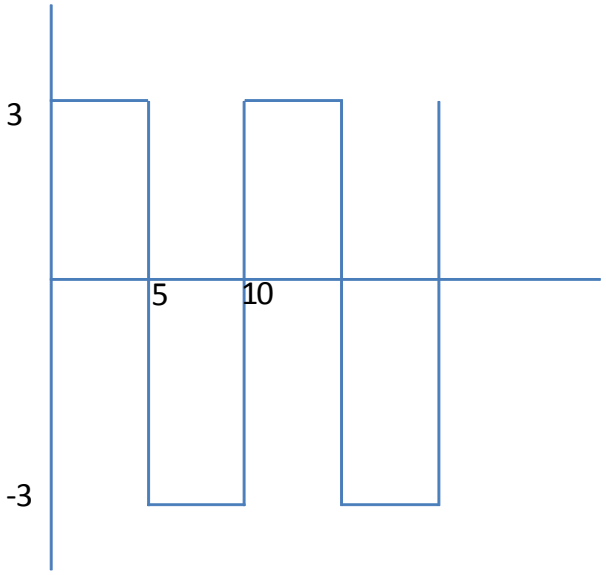
EEL 3123C TEST 2 - DURATION: 1 hour November 9, 2011

1) You are given a square wave with time period T=10 having amplitude that swings 6 units. Place the x-axis and y-axis appropriately so that you can exploit computational simplifications from quarter-wave symmetry. Then, compute a_v, a_k, and b_k. (50)By above Figure, it shows QW symmetry and is odd, then



$$a_v = 0 \text{ (HW symmtery)}$$

$$a_k = 0 \text{ for all } k$$

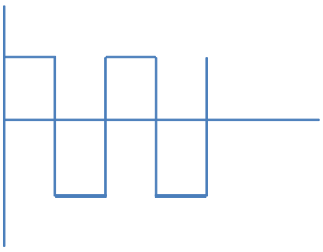
$$b_k = 0 \text{ for all even } k$$

$$b_k = \int_0^{10/4} 3\sin\left(\frac{k2\pi t}{10}\right) dt = -\frac{15}{k\pi}\cos\left(\frac{k\pi}{5}t\right)|_0^{2.5} = \frac{15}{k\pi}\left(1-\cos\left(\frac{k\pi}{2}\right)\right) = \frac{15}{k\pi}$$

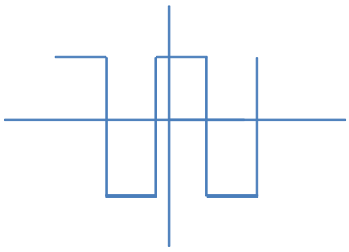
2) Draw an arbitrary periodic function that shows: (a) odd symmetry, (b) neither even nor odd symmetry, (c) even and quarter-wave symmetry, (d) half-wave symmetry but not quarter-wave symmetry. Show at least one full cycle for each. (4 + 6 + 8 + 12)

3) Given a series LCR circuit, mark appropriate terminals for output voltage readout so that the circuit acts as a: (1) low-pass, (2) high-pass, (3) band-pass, and (4) band-stop. (20)

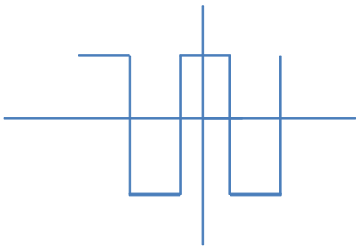
   For (1) read across capacitor, (2) read across inductor, (3) read across resistor, (4) read across inductor capacitor combination.



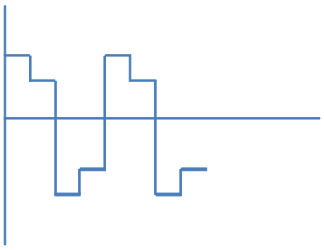
Odd



Neither Even Nor Odd



Even and Quarter Wave



Half Wave but not Quarter Wave