(30) 1. **Signals, Fourier series, transfer functions, frequency response:** (t in seconds)

(05) a. For the signal $100\cos(14\pi t)$, specify each of the following: (i) rms amplitude; (ii) peak-to-peak amplitude (iii) period (iv) frequency in Hz (v) frequency in $\frac{\text{radians}}{\text{second}}$.

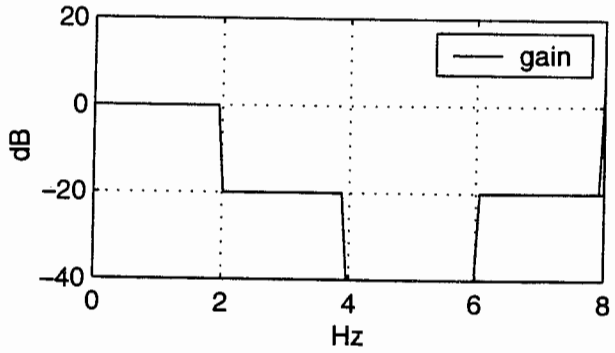
(05) b. For the signal $x(t) = \cos(2\pi t) + 20\cos(6\pi t) + 400\cos(10\pi t)$, specify following: (i) period (ii) fundamental frequency in Hz (iii) harmonics frequencies in Hz.

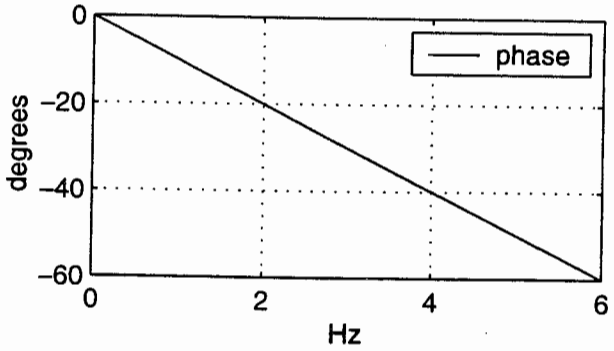
(10) c. $x(t)$ is input into a system with phase response=0 and gain=$\begin{cases} 1 & \text{for } 0 < f < 4Hz \\ 0 & \text{for } 4Hz < f < \infty \end{cases}$

NOT IN dB!

Compute the output of the system.

(10) d: $x(t)$ is input into a system with the gain and phase responses plotted below. Compute the output of the system.



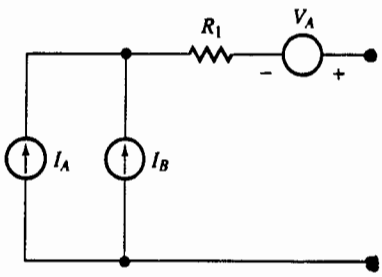


(40) 2. **Simple circuits, circuit elements and power:**

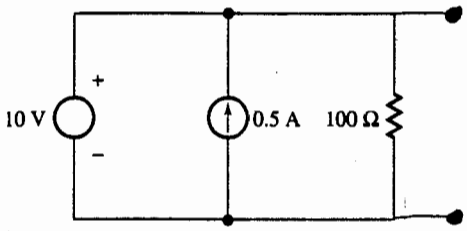
(05) a. A 12V source is connected across a 10Ω resistor and 5Ω resistor in series. What voltage would an *ideal* voltmeter measure across the 10Ω resistor?

(15) b. Combine each of the following into a single equivalent source or resistor: Explain your reasoning briefly for each circuit in the blank space below.

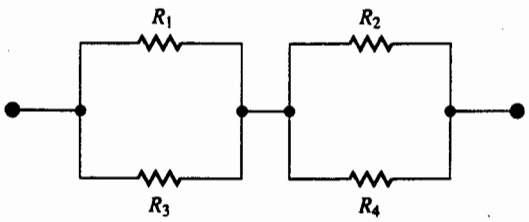
(i)



(ii)



(iii)



(20) c. For the circuit shown at right compute the power *dissipated* by each resistor and source. Show that power is conserved.