ECE 252 | **Introduction to Electrical Engineering** | **Quiz 10P**
100 Points | **Show your work.** | **Practice Solution**

1. (50) v(t) = 83 COS (32t - 97°) V. Find frequency in Hz, frequency in radians per second, period, maximum voltage, minimum voltage, peak-to-peak voltage, RMS voltage, average voltage, voltage expressed as a phasor, and voltage at t=5 ms. How much average power will be consumed by a 12 Ω resistor connected across this voltage?

$\omega = 32$ rad/s

$f = \omega/2\pi = 5.09$ Hz

$T = 1/f = 0.196$ s

$V_{max} = 83$ V

$V_{min} = -83$ V

$V_{p\text{-}to\text{-}p} = 2(83) = 166$ V

$V_{rms} = 83/\sqrt{2} = 58.7$ V

$V_{AVG} = 0$ (by inspection)

$\vec{V} = 83 \angle -97°$ V

$v(.005) = 83 \cos(32(.005) - 97°)$

$= 83 \cos(.16 \text{ rad} - 97°)$

$= 83 \cos(9.17° - 97°) = -3.14$ V

$P = V_{rms}^2 / R = 58.7^2/12 = 287$ W

2. (5) Convert –5 + j12 to polar form.

$13 \angle 113°$

3. (5) Convert $7e^{j0.4\pi}$ to rectangular form.

$7 \angle .4\pi \times \frac{180}{\pi} = 7 \angle 72° = 2.16 + j6.66$

4. (20) Simplify. Give your answer in rectangular form.
$(6\angle 19°)(40 + j51)/[(2 - j7)(5\angle -147°)]$

$$\frac{6 \angle 19° (64.82 \angle 51.9°)}{7.28 \angle -74.1° (5 \angle -147°)} = 10.68 \angle 292° = 3.99 - j9.91$$

5. (20) Simplify. Give your answer in polar form.
$(12 - j5)/(3\angle 106°) - (250\angle 19°)/(127 - j45)$

$$\frac{13 \angle -22.6°}{3 \angle 106°} - \frac{250 \angle 19°}{134.7 \angle -19.5°} = 4.333 \angle -128.6° - 1.856 \angle 38.5°$$

$= (-2.703 - j3.387) - (1.453 + j1.155) = -4.156 - j4.542 = 6.16 \angle -132°$