1. For a half wave rectifier circuit with a capacitor for filtering, derive the formula for the ripple voltage in terms of the time period, peak voltage, and the capacitance and the load resistance. Draw the schematic and wave forms for the circuit. (10 points)

2. Draw the schematic, draw the relevant waveforms and derive the formula for output voltage in terms of the input voltage for a boost converter. (10 points)

3. Given $v_s = 15V$, operating frequency being 60Hz, $R = 100 \ \Omega$, $C = 1000 \ \mu F$, on voltages of the diode are 0.7 volts and the zener voltage of the diode is 15Volts. What is the DC voltage at $V_1$? What is the DC output voltage? What is the magnitude of the ripple voltage at $V_1$? What is the minimum PIV rating for the diodes? (10 points)