1) For a diode,

a) If the current through a diode is 18mA what is the diode’s ac resistance.

b) Draw the circuit that is represented in the figure below and find the values of all the components in the circuit (parts a & b of this problem are NOT related to each other).

a) best is $r_d = 26\text{mV}/18\text{mA} = 1.4 \text{ ohms}$ accepted $\Delta V_d/\Delta I_d$ at the Q-point

b) $R_1 = 9\text{V}/20\text{mA} = 450 \text{ ohms}$
2) Plot the output voltage waveform for the circuit below. When the diode is on the forward voltage drop is 0.7v.

![Circuit Diagram]

Positive peak is about -2.3V. 9pts
Negative peak is -10V. 9pts
Shape 7pts

With both input and output waveforms show below,
3) Determine the value of the collector voltage, $V_c$ in the circuit below. Do NOT neglect the base current. $\beta = 40$

$$E_{th} = 12 \frac{15k}{(43k+15k)} = 3.1V \quad 6pts$$

$$R_{th} = 43k \times \frac{15k}{(43k+15k)} = 11.12k \quad 6pts$$

$$E_{th} - IB \times R_{th} - 0.7 - (1+\beta)R_e = 0 \quad 7pts$$

$$IB = 23.68\mu A$$

$$V_{cc} - \beta \times IB \times R_c = V_c \quad 6pts \quad (-4 \text{ leaving out } V_{cc})$$

$$10.295V$$
4) Given the circuit and characteristics below determine the following:

a) The supply voltage, Vcc.  
   \[ Vcc = 30 \text{V} \]  
   \[ 6 \text{pts} \]

b) The value of the collector resistor, Rc.  
   \[ \frac{30}{8k} = 3.75k \]  
   \[ 6 \text{pts} \]

c) The base current, \( I_B \).  
   \[ I_B = \frac{30-0.7}{1000k} = 29.3\mu\text{A} \]  
   \[ 7 \text{pts} \ (-2 \text{ for neglecting } 0.7) \]

d) The values of \( I_{CQ} \) and \( V_{CEQ} \).  
   Intersection of \( I_B \) & load line is the Q-point  
   \[ I_{CQ} = 4.2\text{mA}, \ V_{CEQ} = 14.5\text{V} \]  
   \[ 6 \text{pts} \]
Scores
1. ______
2. ______
3. ______
4. ______
Total ______