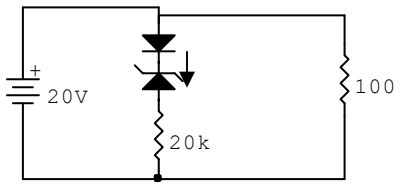
FOURTH SEMESTER EXAMINATION -2005
BASIC ELECTRONICS

Answer question no. 1 which is compulsory and any five from rest

1. Answer the following. 2x10

a. If the depletion width of a p-n junction with doping levels of $N_A = 10^{16}$ /cm^3 and $N_D = 10^{18}$ /cm^3 is x_d ,what distance does the depletion region penetrate into n-side of the jnction?

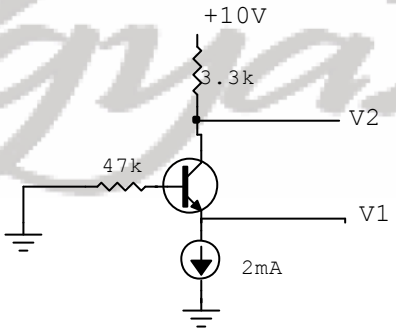
b. What is the value of the current I in the following circuit assuming V_z =5.6V and V_D =0.7V.



c. If $292_{10} = 1204_b$, determine the value of b.

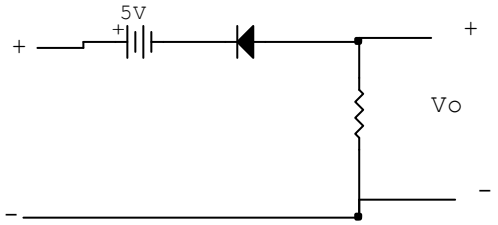
d. Convert the decimal number 359 to its octal equvalent .

e. Find the node voltage V_2 and I_c for the following circuit . Take β to be very high.



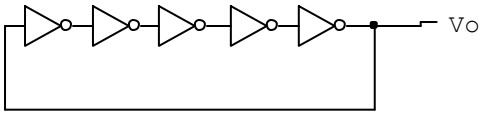
f. An enhancement type NMOs transistor with V_1 =2V has its source terminal grounded and its gate is given given 3V . In what region of operation the device operates for V_D =5V and V_D =1V ?

g. Draw and scale the output waveform of the following circuit if a sinewave of 10V p-p is applied to the following circuit.



h. A 10V forward voltage is applied to a silicon diode in series with a load of 10KΩ . Draw the dc load line and find its slope.

i. If each inverter in the following figure hs a propagation delay of 10ns , determine the waveshape of the output waveform V_o. What is its frequency ?



j. Apply DeMorgan's law to the following expression :

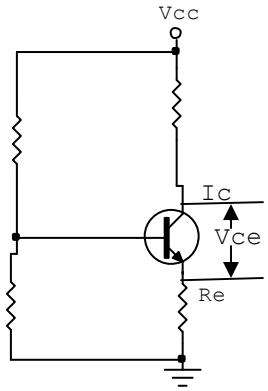
$\overline{A\bar{B}(C+\bar{D})}$

2. A germanium diode displays a forward voltage of 0.25V at 10mA current at room temperature (300°K) Estimate the reverse saturation current(I_s) assuming unity ideality factor . Calculate the bias voltage needed for diode currents of 1mA and 100mA. Also estimate the valves of I_s and diode forward current at 0.25V at 30°C above room temperature. 10

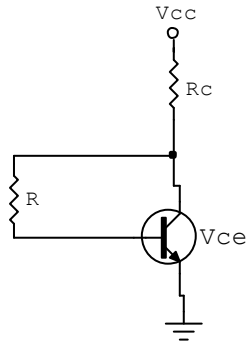
3. A bridge rectifier uses a diode with forward resistance of 5Ω and secondary voltage is 30V(rms). Determine the dc output voltage for I_{dc} =200mA and the rms value of the output ripple voltage. 10

4. For both the circuit shown below calculate I_B, I_c and V_{CE}. Take V_{cc} =22V, V_{BB}=5V, R_B=86K, R_c =1K, R_E=1K, R_F=80K, V_{BE}=0.7V and β=120. 5+5

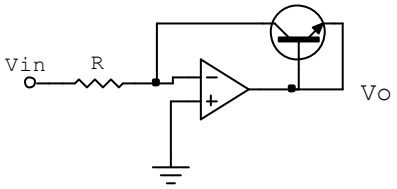
a.



b.



6. Derive the transfer caracterstics in terms of R, I_s (I_s being the reverse saturation current of the transistor) and V_T. Assume n= 1 . 10



7. a. Bring out the essential difference between an analog communication system and a digital communication system. 5

b. What type of time base is used ina CRO ? Explain with a neat sketch.. 5

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