QUIZ -01 **Date: 14-02-2025**

INTEGRATED ELECTRONICS

ECE 214

Time 1 Hr. 20 Min. **Max. Marks 20**

(All plagiarism policy of IIIT Delhi is applicable)

1. For each of the cases mentioned in Table I and Table II find weather the transistor is in active, saturation and cut off mode? (All values are in volts)

Table I for NPN

Case	V_B	V_E	V_C	
1.	0.7	0	0.7	A
2.	0.8	0	0.1	S
3.	0	-0.7	-0.6	S
4.	-2.0	-2.7	0	A

Table II for PNP

Case	V_B	V_E	V_C	
1.	-0.68	0	-0.68	A
2.	-0.78	0	-0.1	S
3.	0	0.68	0.56	A
4.	3.18	2.58	0	C

(4 Marks, CO1, CO2)

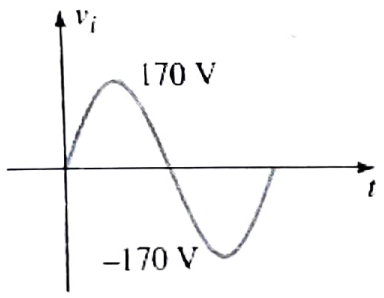
2. (a) A npn transistor having a reverse saturation current I_{CBO} =10μA is operated in CE mode. If the base current is 250μA. Calculate I_C and I_E, assume that α = 0.98.

(2 Marks, CO2)

(b) Determine the output waveform for the network of Fig.1 and calculate the average and rms voltage level. (Assuming all diodes are ideal)

$\beta I_B + (\beta+1) I_{CBO}$

$I_C = 12.75\,mA$



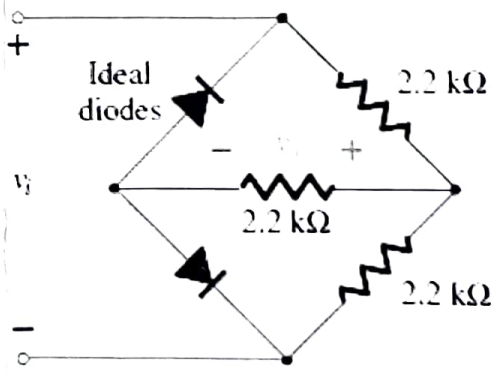


Fig.1

(3 Marks, CO1, CO2)

3. Given the device characteristics of Fig.2 and Fig.3 for the fixed-bias configuration, considering V_{BE} =0.7 V determine V_{CC}, R_B and R_C.

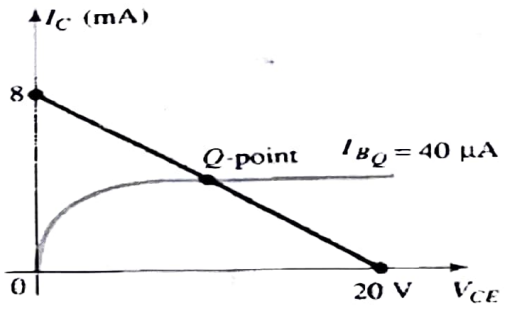


Fig.2

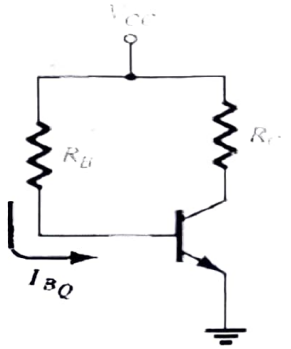


Fig.3

(3 Marks, CO2)

4. From Fig. 4 determine the voltages at all nodes and the currents through all branches. Assume that the transistor β is specified to be at least 50. Considering V_{BE} = 0.7 V and also check the BJT is in active mode, if not in active mode, then assume given transistor is in **deep saturation mode**. Also calculate β_{forced} if required.

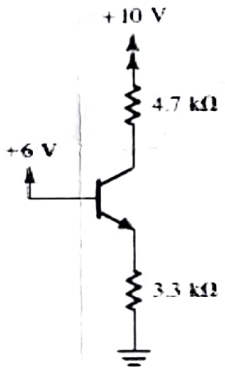


Fig.4

(5 Marks, CO2)

5. Find the values of *I* and *V* in the circuits shown in Fig. 5 assume all diodes are ideal.

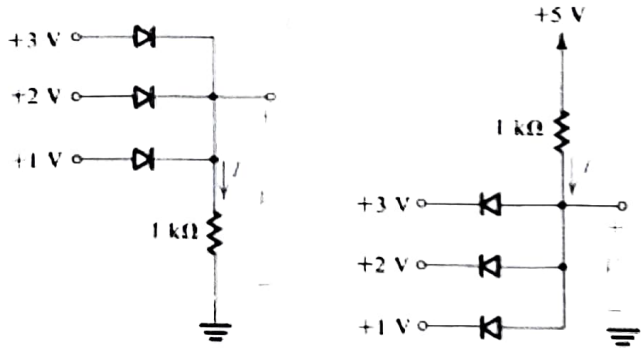


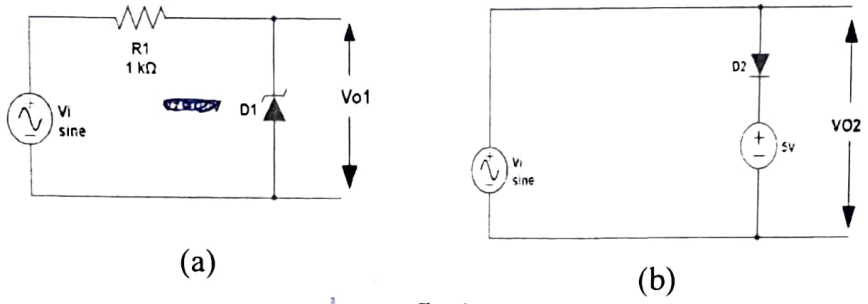
Fig.5

(3 Marks, CO1)

1. For the circuit shown below in fig.1 & fig.2.
   a) Calculate the o/p voltages V_{o1} and V_{o2} in fig .1(a) and fig.1(b) for V_m= 4.2V, 5V ,5.7V, 10V theoretically.
   b) When o/p voltage of fig1(a) feeds to input of fig1(b), the cascaded circuit is achieved, shown in fig.2.then calculate o/p voltage of cascaded circuit V_{o2} for V_m= 4.2V, 5V ,5.7V, 10V theoretically.
   c) Sketch the o/p voltage waveform of the cascaded circuit given in fig.2 for V_m=4.2, 5V ,5.7V, 10V on LTspice.

Assuming Zener diode as ideal and forward bias voltage drop of normal diode to be 0.7V (Assume $V_i=V_m\sin\omega t$).

+ 5.7
- same



(a) (b)

fig.1

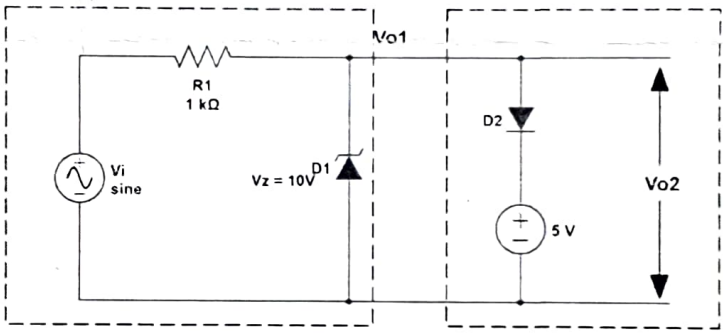


fig.2

Simulation Tutorial 02

1. In the BJT amplifier circuit shown below in Fig.1. Assume V_{BE} is 0.7 V. The collector voltage Vc is given as 5V.
   (a) Draw the Thevenin equivalent of the given circuit and calculate the value of resistance R_2 theoretically, when β is 100. [3 Marks, CO2]
   (b) Calculate the Q point for β_1 =100 and β_2 =150. (Put R_2 obtained from part(a)) [2 Marks,CO2]
   (c) Show the operating points and plot the I_c v/s V_{CE} characteristics of Thevenin equivalent circuit when β_1 =100 and β_2 =150 using LTspice. [5 Marks,CO2]

Note: Use transistor 2N2222, NXP, NPN from the library and edit β_1, and β_2 values according to the question.

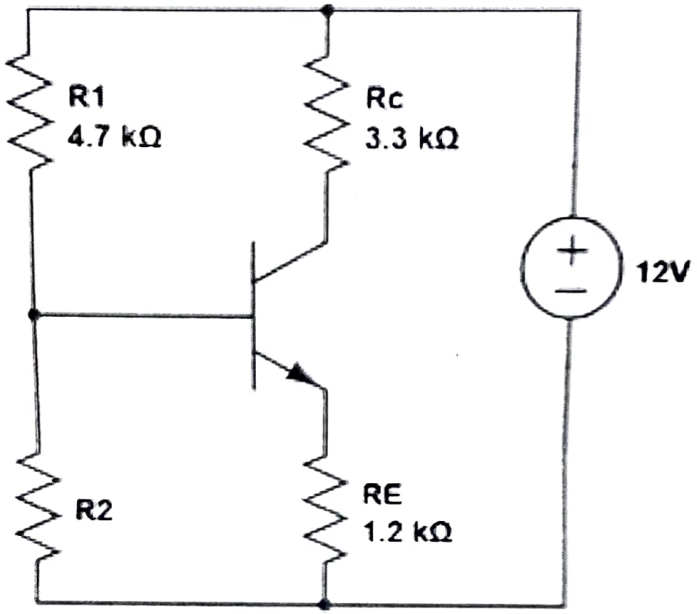


Fig.1