

Electronic Circuit Analysis & Design

[Time: Three Hours]

MAY-18 19

[Marks:80]

N.B:

1. Question.No.1 is compulsory.
2. Attempt any Three out of remaining four questions.
3. Assums any suitable data wherever requested but justify the same.

Attempt any 4

a) Draw V-I characteristics of P-N junction diode and explain how zanier diode characteristics differs from that of P-N junction diode.

b) Find IC and VCE for circuit shown below

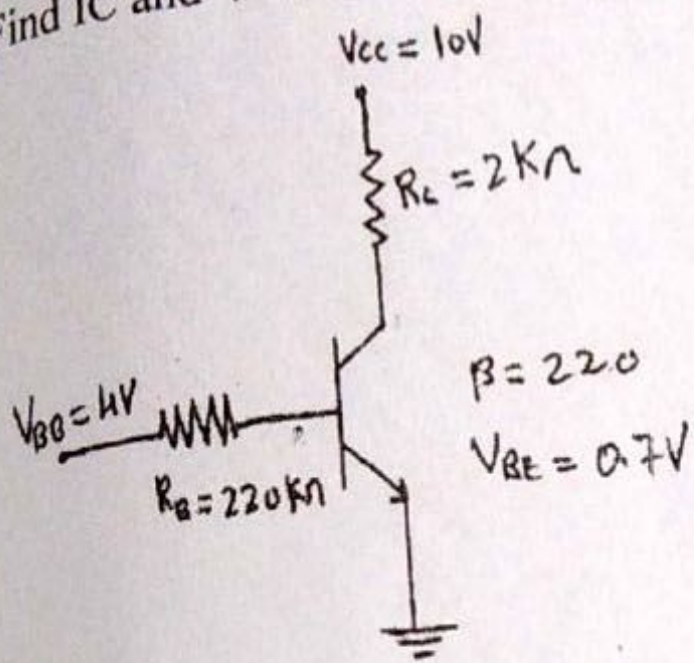


Fig 1

c) Justify "CB amplifier has larger bandwidth than CE amplfur."

d) Derive the condition for zero temperature drift in JFET.

d) Explain the need of cascaded amplifier and list various types of cascaded configurations.

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Q.2. Attempt the following questions :

a) Derive expression for current stability factor in case of fixed bias and voltage divider bias for BJT.

b) Find Av, Zi, and Zo for following circuit

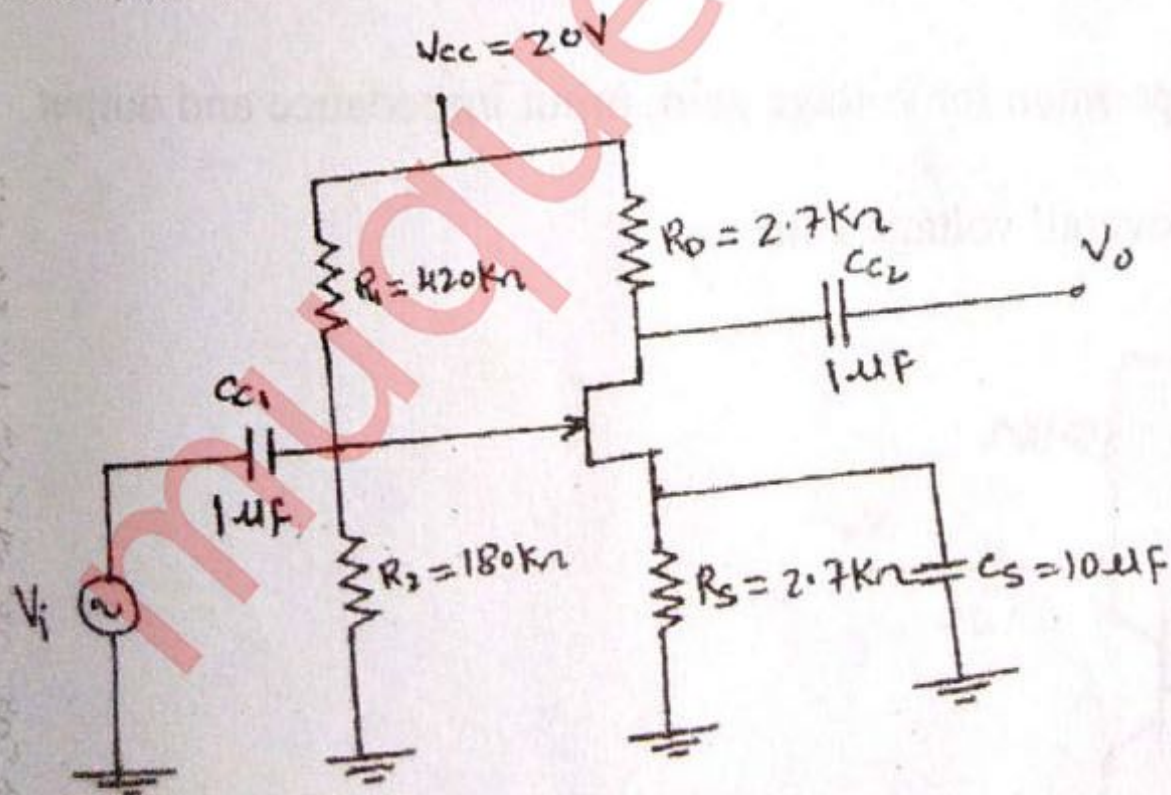


Fig 2

Given :  $I_{DSS} = 12\text{mA}$ ,  $V_p = 4\text{V}$  and  $Y_d = 41.7\text{k}\Omega$

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- Q.3. Attempt the following questions:
- Draw the structure of MOSFET (E-type, n-Channel) and explain its operation under
    - Cut-off region
    - Linear region
    - Saturation region
  - Find  $I_{CQ}$  and  $V_{CEQ}$  for the circuit given below if  $\beta = 100$  and  $V_{BE} = 0.7V$

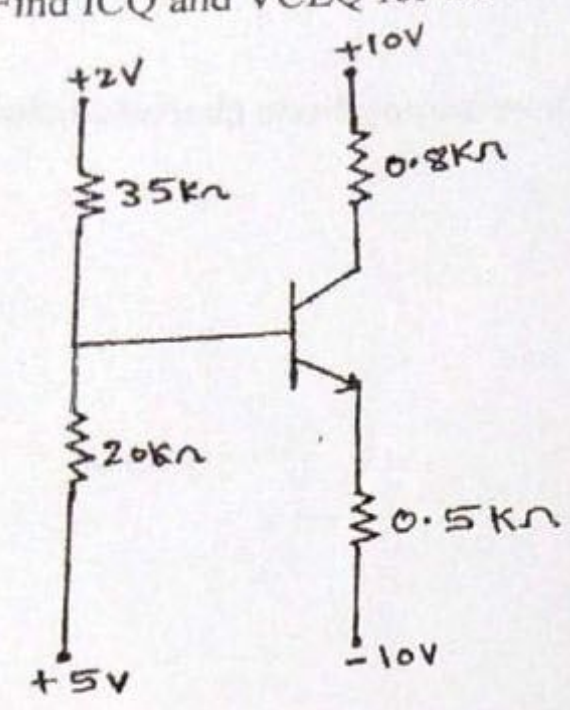
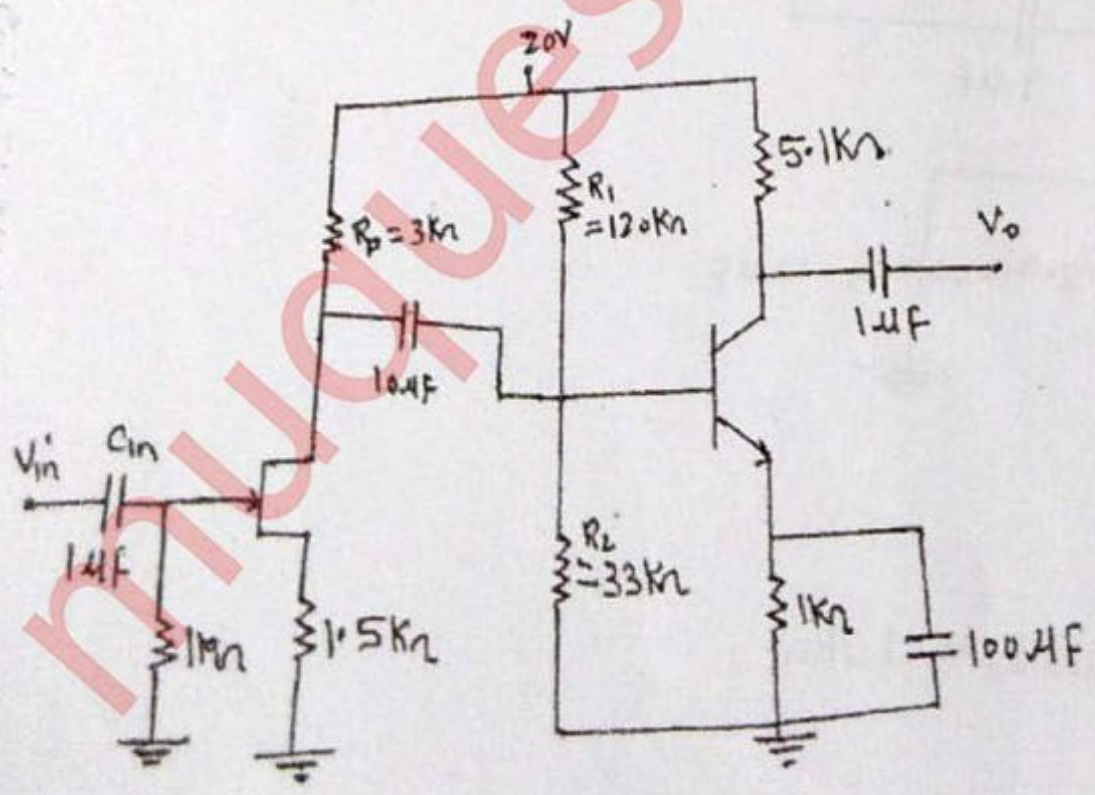


Fig 3

- Q.4. Attempt the following questions:
- Design a single stage RC coupled CE amplifier to meet the following specification:
    - $V_{op} = 3V$
    - $|A_v| \geq 120$
    - $S_{ICO} \leq 8$
    - $f_L$  better than  $20H_2$
    - $R_i \geq 3K\Omega$
  - For amplifier designed in question 4(a), draw small-signal model and calculate  $A_v$ ,  $R_i$ , and  $R_o$ .

- Q.5. Attempt the following questions:
- Draw cascode amplifier. Derive expression for voltage gain, input impedance and output impedance.
  - For the following circuit calculate overall voltage gain



For JFET :  $I_{DSS} = 10mA$ ,  $V_p = -4V$   
 For BJT :  $h_{ie} = 4.5k\Omega$ ,  $h_{fe} = 180$

- Q.6. Write a short note on (any 4)
- a) Self biasing for JFET
  - b) Miller Theorem
  - c) MOSFET applications
  - d) Zener diode
  - e) Darlington Amplifier

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2/6/18

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Q.P. Code : 40502

DBEC DATA SHEET

Transistor type	P <sub>dmax</sub> @ 25°C Watts	I <sub>cmax</sub> @ 25°C Amps	V <sub>CE</sub> volts d.c.	V <sub>CE(sat)</sub> volts d.c.	V <sub>CE0</sub> (Sus) volts d.c.	V <sub>CE(sus)</sub> volts d.c.	V <sub>CEX</sub> volts d.c.	V <sub>ES0</sub> volts d.c.	T <sub>Jmax</sub> °C	D.C. current		Small Signal		V <sub>BE</sub> max.	θ <sub>JA</sub> °C/W	Derate above 25°C W/°C
										min	typ.	max.	typ.			
2N 3055	115.5	15.0	1.1	100	60	70	90	7	200	20	50	15	50	1.8	1.5	0.7
ECN 055	50.0	5.0	1.0	60	50	55	60	5	200	25	50	25	75	1.5	3.5	0.4
ECN 149	30.0	4.0	1.0	50	40	—	—	8	150	30	50	33	60	1.2	4.0	0.3
ECN 100	5.0	0.7	0.6	70	60	65	—	6	200	50	90	50	90	0.9	35	0.05
BC147A	0.25	0.1	0.25	50	45	50	—	6	125	115	180	125	220	0.9	—	—
2N 525(PNP)	0.225	0.5	0.25	85	30	—	—	—	100	35	—	—	45	—	—	—
BC147B	0.25	0.1	0.25	50	45	50	—	6	125	200	290	240	330	—	—	—

BFW 11—JFET MUTUAL CHARACTERISTICS

Transistor type	h <sub>ie</sub>	h <sub>oe</sub>	h <sub>re</sub>	θ <sub>JA</sub>	Mutual Characteristics													
					-V <sub>GS</sub> volts	I <sub>D</sub> max. mA	I <sub>D</sub> typ. mA	I <sub>D</sub> min. mA	T <sub>J</sub> max. °C	P <sub>d</sub> max. @25°C	V <sub>GS</sub> max. Volts	V <sub>DS</sub> max. Volts	V <sub>DS</sub> max. Volts	I <sub>DSS</sub>	g <sub>ms</sub> (typical)	-V <sub>P</sub> Volts	r <sub>d</sub>	Derate above 25°C
BC 147A	2.7 K Ω	18 μ Ω	1.5 × 10 <sup>-4</sup>	0.4°C/mW	0.0	0.2	0.4	0.6	0.8	1.0	1.2	1.6	2.0	2.4	2.5	3.0	3.5	4.0
2N 525 (PNP)	1.4 K Ω	25 μ Ω	3.2 × 10 <sup>-4</sup>	—	10	9.0	8.3	7.6	6.8	6.1	5.4	4.2	3.1	2.2	2.0	1.1	0.5	0.0
BC 147B	4.5 K Ω	30 μ Ω	2 × 10 <sup>-4</sup>	0.4°C/mW	7.0	6.0	5.4	4.6	4.0	3.3	2.7	1.7	0.8	0.2	0.0	0.0	0.0	0.0
ECN 100	50 Ω	—	—	—	4.0	3.0	2.2	1.6	1.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ECN 149	15 Ω	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
ECN 055	12 Ω	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2N 3055	6 Ω	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

N-Channel JFET

Type	V <sub>DS</sub> max. Volts	V <sub>DS</sub> max. Volts	V <sub>GS</sub> max. Volts	P <sub>d</sub> max. @25°C	T <sub>J</sub> max. °C	I <sub>DSS</sub>	g <sub>ms</sub> (typical)	-V <sub>P</sub> Volts	r <sub>d</sub>	Derate above 25°C	θ <sub>JA</sub>
2N3822	50	50	50	300 mW	175°C	2 mA	3000 μ Ω	6	50 K Ω	2 mW/°C	0.59°C/mW
BFW 11 (typical)	30	30	30	300 mW	200°C	7 mA	5600 μ Ω	2.5	50 K Ω	—	0.59°C/mW

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