

B TECH
(SEM IV) THEORY EXAMINATION 2022-23
ANALOG CIRCUITS

Time: 3 Hours

Total Marks: 100

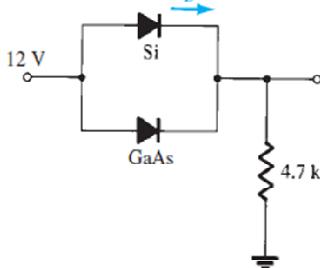
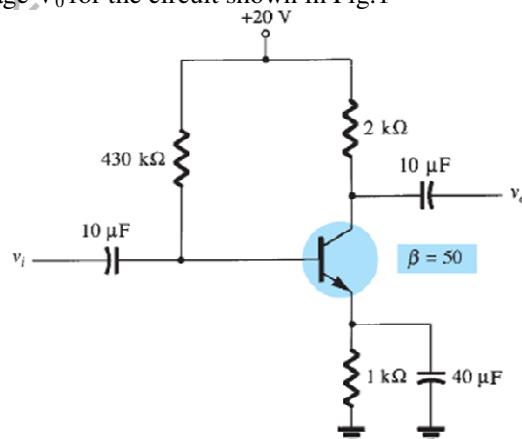
Note: Attempt all Sections. If require any missing data; then choose suitably.

SECTION A**1. Attempt all questions in brief.****2 x 10 = 20**

- (a) Draw V-I characteristics of ideal and piecewise linear model of diode with support of mathematical equations.
- (b) Define knee voltage and breakdown voltage of a diode and write down it's mathematical expressions.
- (c) Sketch the equivalent circuit model of the trans-resistance and write the ideal values of terminal characteristics.
- (d) Why common emitter configuration of BJT preferred to design an amplifier circuit among other BJT configurations?
- (e) Draw the circuit diagram of a unity gain amplifier using op-amp and write its applications.
- (f) Define different parameters used in high frequency hybrid- π model.
- (g) An amplifier has a mid-band gain of 120 and bandwidth of 250 KHz. If 6% negative feedback is introduced, find the new bandwidth and gain.
- (h) Define minimum sustainable voltage and maximum usable load of a Current mirror Circuits.
- (i) Write the ideal characteristics of an operational amplifier.
- (j) Explain Barkhausen criterion.

SECTION B**2. Attempt any three of the following:****10x3=30**

- (a) Calculate current I_D and output voltage V_o for the circuit shown in Fig.1

**Fig.1****Fig.2**

- (b) Find the DC bias point (operating point) for the circuit shown in Fig.2
- (c) Derive the expression of frequency of oscillation for RC phase shift oscillator. And narrate its salient features.
- (d) Describe the basic structure and operation of differential amplifier using BJT.
- (e) Illustrate super diode and describe the operation of full wave precision rectifier with suitable circuit diagram.

SECTION C

3. Attempt any one part of the following:

10x1=10

- (a) Sketch the frequency response of single stage RC coupled BJT amplifier and describe the same for multistage amplifier.
- (b) Derive the expression of voltage gain, input resistance and output resistance of common source amplifier.

4. Attempt any one part of the following:

10x1=10

- (a) The BJT in the circuit of Fig.3 has $\beta = 100$.
 - (i) Find the DC collector current and the de voltage at the collector.
 - (ii) Replacing the transistor by its T model, draw the smallsignal equivalent circuit of the amplifier. Analyze the resulting circuit to determine the voltage gain V_0/V_i .

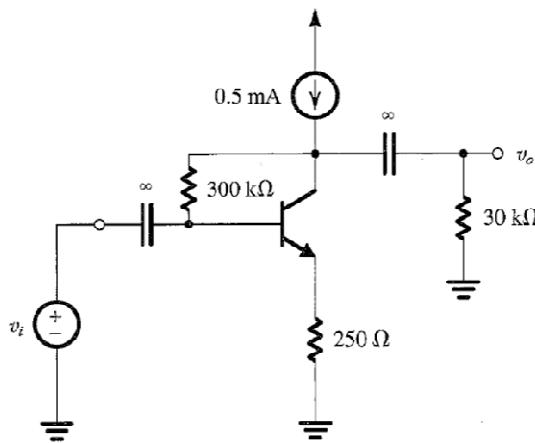


Fig.3

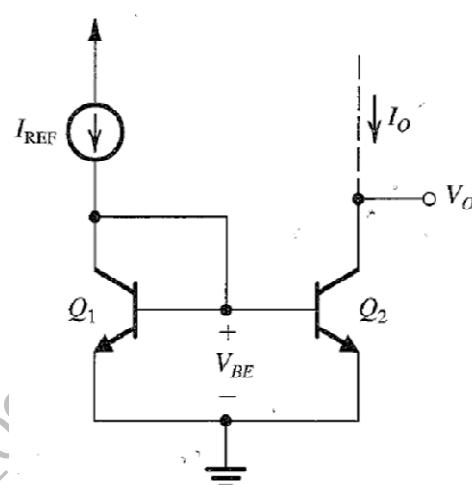


Fig.4

- (b) Consider the basic BJT current mirror of Fig.4 for the case in which Q_2 has m times the area of emitter base junction of Q_1 . Show that the current transfer ratio is given by $I_0 = m I_{\text{REF}}$.

5. Attempt any one part of the following:

10x1=10

- (a) Illustrate the different design stages of operational amplifier.
- (b) Design an astable multivibrator circuit using op-amp having frequency of oscillation 5KHz.

6. Attempt any one part of the following:

10x1=10

- (a) Discuss the operation of negative feedback with suitable block diagram and describe its properties in detail.
- (b) Explain the circuit of wide bandpass active filter and design a wide bandpass filter having lower cut off frequency 3KHz and higher cutoff frequency 30KHz with passband gain of 12 dB.

7. Attempt any one part of the following:

10x1=10

- (a) Explain the operation of class B amplifier and discuss its drawback. Any one way to overcome the drawback.
- (b) Design the following circuits using op-amp
 - i) Unity gain amplifier
 - ii) Integrator circuit.