

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 3002

Roll No.

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B.Tech.

THIRD SEMESTER EXAMINATION, 2004-2005

SOLID STATE DEVICES AND CIRCUITS

Time : 3 Hours

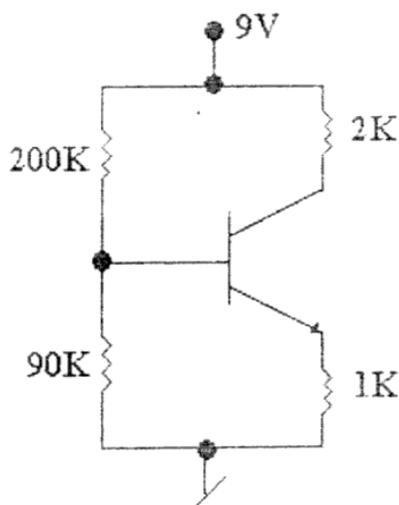
Total Marks : 100

Note : Attempt ALL the questions. Assume the missing data, if any and justify the assumptions made.

1. Answer any four of the following :

[5x4=20]

(a) Find the I_C and V_{CE} for the following circuit, if $\beta = 100$.



- (b) Is $|V_{BEsat}|$ greater or lesser than $|V_{CEsat}|$? Explain.
- (c) Draw the Ebers-Moll model for a n-p-n transistor and explain.
- (d) Explain all the region of operations of a BJT.
- (e) The output of a dc power supply is observed on an oscilloscope and found to have approximately sinusoidal ripple of 5V p-p superimposed on a d-c level of 15 V. Determine the % ripple. Sketch the waveform of this voltage.
- (f) Explain the working of a bridge rectifier with neat diagrams.

2. Answer *any four* of the following : [5x4=20]

- (a) If $V_p = -6V$ and $I_{DSS} = 8 \text{ mA}$, plot g_m versus I_{DSS} for JFET.
- (b) Derive the expression for voltage gain at low frequencies and output resistance of a common source (potential divider biasing) amplifier.
- (c) Explain the JFET operation as a voltage variable resistance.
- (d) Compare the two devices JFET and MOSFET.
- (e) Write a note on JFET biasing.
- (f)
 - (i) State the significance of W/L ratio on the drain current in a MOSFET.
 - (ii) State that why the input resistance of JFET is very high.

3. Answer *any two* of the following : [10x2=20]

- (a)
 - (i) Explain the function of 'coupling capacitor' and 'bypass capacitor'.
 - (ii) What is early voltage of a BJT ? Explain.

(iii) Draw the circuit of emitter follower using a Darlington connected pair and explain the advantage of using Darlington pair.

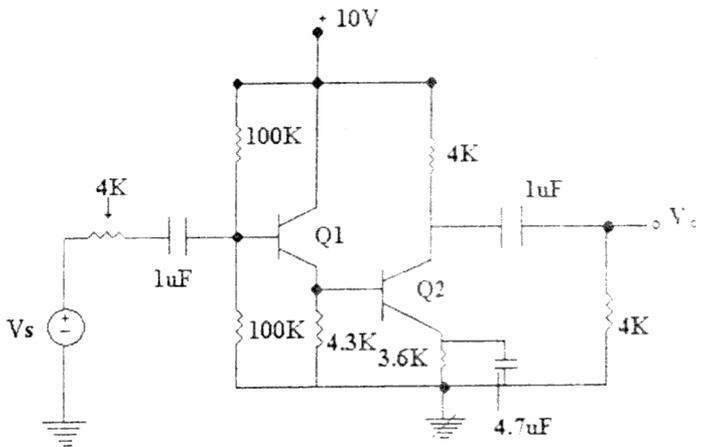
(b) Why multi staging is done ? Enlist the merits and demerits. Draw the circuit of a two stage R-C coupled amplifier and explain the operation. What will happen if both by-pass capacitors are open circuited simultaneously?

(c) Write notes on the following :

(i) Class AB push pull amplifier. (ii) Heat sink of output transistors.

4. Answer *any two* parts of the following : [10x2=20]

(a) Consider the following circuit with each transistor $\beta = 100$, $f_T = 400$ MHz and $C_{\mu} = 2$ pf. Neglect r_x and r_o . Determine the mid band gain and high frequency response.



(b) Draw the small signal hybrid π model at high frequency. Explain the complete model. Prove that $h_{fe} = g_m r_{b'e}$.

(c) What do you understand by CASCODE amplifier. Explain in detail with neat circuit diagram.

5. Answer *any two* of the following : [10x2=20]

(a) What are the different parameters of amplifier that are modified with negative feed back ? Define desensitivity D and discuss the effect of large value of D .

(b) (i) Deduce the expressions for condition of oscillation and frequency of oscillation of Neimbridge oscillator.

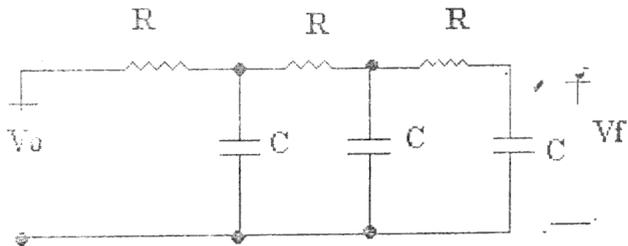
(ii) How the amplitude of the output of this oscillator stabilized ? Explain.

(c) For the following feed back network find,

(i) the transfer function.

(ii) the input impedance.

(iii) the frequency of oscillation and minimum amplifier voltage gain, if this network is used in feed back path.



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