B. TECH.

THIRD SEMESTER EXAMINATION, 2003-2004
SOLID STATE DEVICES & CIRCUITS

Time : 3 Hours   Total Marks : 100

Note : Attempt **ALL** questions.

1. Attempt any FOUR of the following :—   (5×4=20)

    (a) In the output of a fullwave rectifier, L-C filter
         is connected with $C = 1000\mu F$, 16 V and
         $L=10$ mH. The resultant power supply is 6 V,
         500 mA. Find the value of bleeder resistance.

    (b) Define the following diode ratings :—
         (i)   PIV
         (ii) I_{dc}
         (iii) Repetitive peak current
         (iv) Non-repetitive peak current
         (v)   Reverse recovery time

    (c) Why is potential divider biasing preferred
         over all other biasing circuits ?

    (d) Find I_C and V_{CE} for the following figure of
         silicon transistor :—

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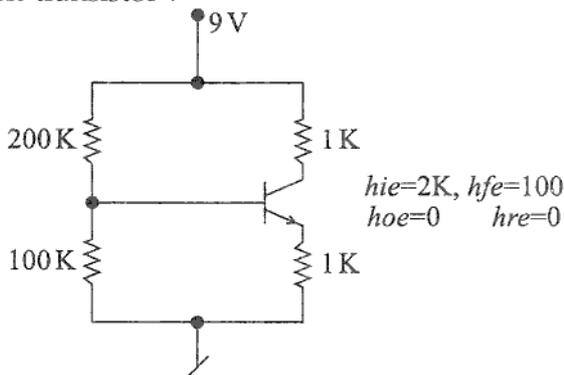
(e) Explain Ebers-moll model of a transistor.

(f) Explain all the different possible regions of operations of a transistor.

2. Answer any FOUR of the following :— (5×4=20)

(a) Can a depletion type MOSFET operate in enhancement mod ? If yes, why and how, and if no, why ?

(b) Describe, in detail, how a JFET is biased.

(c) If $V_P = -4V$ and $I_{DSS} = 4\,mA$ plot gm versus I_{DSS} for a JFET.

(d) How is an FET used as voltage variable resistance ? Explain.

(e) Deduce the voltage gain of a common-source JFET amplifier.

(f) Compare two devices JFET and MOSFET.

3. Answer any TWO of the following :— (10×2=20)

(a) Draw a Darlington emitter follower. Explain why the input impedance is higher than that of a single-stage emitter follower. Add a bootstrap in biasing so that the biasing circuit does not reduce the input impedance drastically.

(b) (i) Explain why even harmonics are not present in a push-pull amplifier.

(ii) Give two additional advantages of this circuit over that of a single transistor amplifier.

(c) Explain the effect of coupling and bypass capacitor in transistorised multistage RC-coupled amplifier. Draw its Gain-frequency plot.

4. Answer any TWO of the following :— (10×2=20)

(a) Draw and explain complete hybrid-π model of a Bipolar Junction Transistor.

(b) What do you understand by CASCODE amplifier ? Explain, in detail, with circuit and expression.

(c) Find gain-bandwidth product of the following circuit :—
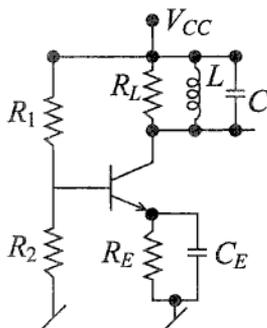
Assume and state simplifying conditions.

5. Answer any TWO of the following :— (10×2=20)

(a) For the circuit shown below, the transistor $hfe = 50$, $hie = 1\cdot1\ K$ and $hoe = hre = 0$. Find (i) Avf (ii) Rif.
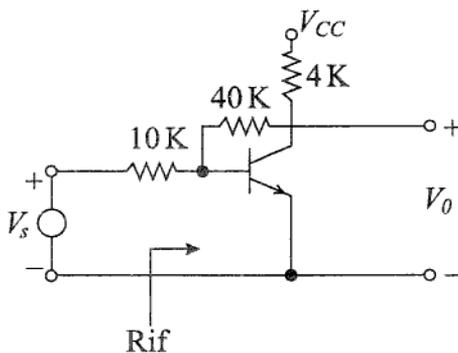
(b) Write notes on the following :—

    (i) Classification of Feedback

    (ii) Berkhousen Criterion

(c)   *(i)* Deduce the condition of oscillation and frequency of oscillation of Wienbridge oscillator.

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

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