Reg. No. : [ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ]

Question Paper Code : 90464

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2022.

Third Semester

Electronics and Communication Engineering

EC 8351 – ELECTRONIC CIRCUITS – I

(Common to : Electronics and Telecommunication Engineering)

(Regulations – 2017)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State the need for biasing an amplifier.

2. Write the conditions for the terminal voltages V_{GS} and V_{DS} of a NMOS transistor to operate in saturation region.

3. Draw the hybrid pi equivalent circuit of BJT in Common Emitter configuration.

4. Give the application of Common Collector configuration.

5. Give the expression for transconductance of MOSFET.

6. Draw the circuit schematic of a BiCMOS amplifier.

7. Give the expression for the unity gain bandwidth of BJT in CE configuration.

8. State Millers theorem.

9. List the merits of LMPS.

10. Compare the peak inverse voltage of a half wave rectifier.

PART B — (5 × 13 = 65 marks)

11. (a) Consider a collector-to-base bias topology. Derive the expressions for the stability factor S, S' and S".

Or

(b) Consider the circuit shown in Figure 1. Draw the load line characteristics, mark significant points and express the slope of the load line. For the given circuit derive the expression for the stability factor S.

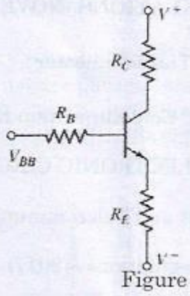

Figure 1.

12. (a) Consider a Darlington configuration connected in common collector configuration. Draw the small signal equivalent circuit and derive the expression for Voltage gain, Input Impedance and Output impedance.

Or

(b) Consider a BJT based differential amplifier with resistive load. Derive the expression for differential voltage gain, common mode voltage gain and CMRR.

13. (a) For the circuit given in Figure 2, draw the small signal equivalent circuit and derive the expression for voltage gain. Draw its AC load line characteristics and explain the maximum symmetrical voltage swing that can be obtained from Figure 2.

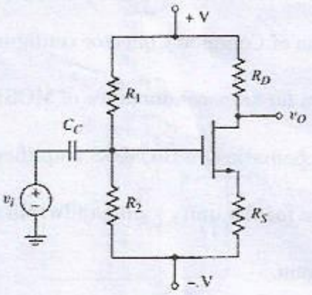

Figure 2.

Or

(b) For the circuit given In Figure 3, draw the small signal equivalent circuit. Derive the expression for voltage gain, current gain, input impedance and output impedance.

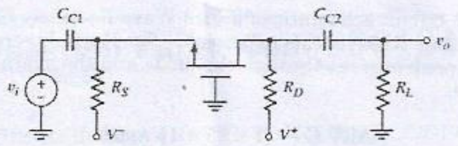

Figure 3.

14. (a) Derive for the transfer function, lower cutoff frequency and upper cutoff frequency of the CE amplifier shown in Figure 4. Draw its frequency response characteristics.

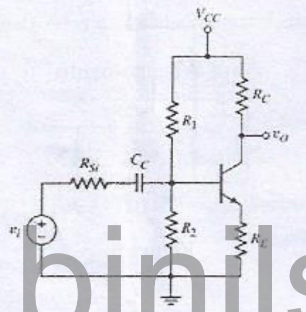

Figure 4.

Or

(b) Derive for the transfer function and unity gain bandwidth of the CS amplifier shown in Figure 5. Draw its frequency response characteristics.

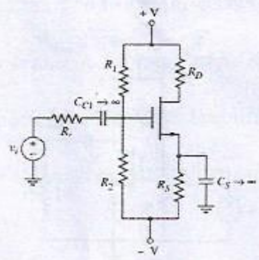

Figure 5.

15. (a) Draw the circuit diagram of a linear voltage series regulator. Explain its principle of operation. Give the expression for its line regulation and load regulation. (4+5+4)

Or

(b) Draw the circuit schematic of a Full Wave Rectifier. Explain its principle of operation. Derive the expression for Peak Inverse Voltage, Ripple Voltage, peak current through the diode and the average current through the diode. (3+4+6)

PART C — (1 × 15 = 15 marks)

16. (a) Consider the circuit shown in Figure 6. Assume $V_{CC} = 5\ V$ and $R_E = 500\,\Omega$. The transistor parameters are $\beta = 120$ and $V_A = \infty$. Design the circuit to obtain a small-signal current gain of $A_i = i_o/i_s = 10$ for $R_L = 500\,\Omega$ Find R_1, R_2, and also the small-signal output resistance R_o.

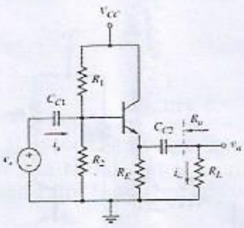

Figure 6.

Or

(b) Consider the circuit shown in Figure 7. Assume $R_S = 4\,k\Omega$, $R_1 = 850\,k\Omega$ $R_2 = 350\,k\Omega$, $and\ R_L = 4\,k\Omega$. The transistor parameters are VTP = 1.2 V, k'p = 40μA/V^2, W/L=80, and $\lambda = 0.05\,V - 1$. Determine quiescent drain current I_D and quiescent voltage V_{SD}. Find the small-signal voltage gain Av = vo/vi. Determine the small-signal circuit transconductance gain $A_g = i_o / v_i$. Find the small signal output resistance R_o.

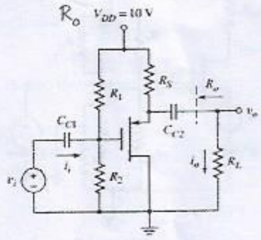

Figure 7.