BIEE 2ND YEAR 2ND SEM. EXAM.-2018

ELECTRONIC CIRCUITS I

Time: Three hours

Full Marks: 100

Set I

Answer any *five* questions from set 1

Marks 4x5

1 a. Show the static and dynamic characteristic of a diode.

b. Draw the transfer characteristic of a diode negative clipper circuit.

c. What should be the regulation value of a perfect rectifier? Justify.

d. Explain the role of a diode in a rectifier circuit.

e. Draw and explain the clamper circuit where the output voltage is clamped to 0 V.

f. What does a diode clipper circuit do? Draw the diagram of a diode clipper that limits the positive peak of the input voltage.

g. Which factors influence the position of the operating point of the transistor amplifier?

Set II

Answer any *three* questions from set 2

Marks 10x3

2. Draw the load line for a CE BJT circuit and state its importance in transistor biasing? When is the load line nearly horizontal and nearly vertical? 2+4+4

3. Show why the source follower FET circuit is so called? Draw a voltage divider bias source follower circuit. For a voltage divider FET circuit, R1=2.1 MΩ, R2=270 kΩ, RD=2.4 kΩ,RS=1.5 kΩand VDD=16 V, find IDQ and VDQ. 4+2+4

4. On which factors is the collector current dependent? How do variations in these factors affect the performance of a transistor amplifier? Explain thermal runaway. 2+4+4

5. Draw the collector to base bias circuit. Why is this circuit considered better than a fixed bias circuit? Find the Q point for this circuit when β=99, V_{BE}=0.7 V, R_L=2 kΩ and R_B=100kΩ. 2+4+4

6. Justify the role of the emitter resistance in a voltage divider bias circuit. In a voltage divider circuit, R_2=5.6 kΩ, R_C=3.3 kΩ, R_E=1.2 kΩ, R_L=2 kΩ, V_{CC}=15 V , V_C=8 V. Find V_E , V_B, I_C and R_1. 4+6

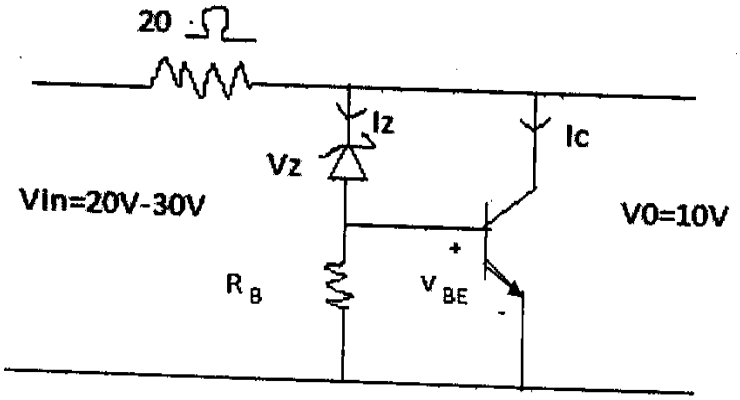
Set III

Answer any *three* questions from set 3 Marks 10x3

7. Illustrate the working of a current mirror circuit as a constant current source with suitable diagram. Calculate the mirrored current I in a current mirror circuit where V_{CC}=12 V, V_{BE}=0.7 V and R_X=1.1kΩ 6+4

8. State the usefulness of a darlington amplifier. For a darlington amplifier circuit, let V_{CC}=18 V, R_C=75Ω, R_B=2MΩ, β_1 =140,β_2=180. Calculate I_{B1}, I_C (common) and V_O. 4+6

9. Draw a series and a shunt voltage regulator circuit. Which device in the circuit acts as the control element and why? The transistor shunt voltage shown in the figure below has a regulated output voltage of 10V, when input varies from 20 volts to 30 volts. The relevant parameters for zener diode and the transistor are: V_z =9.5 volts, V_{BE}=0.3 volts, and β=99. Neglect the current through R_B. Calculate the maximum power dissipated through zener diode (P_z) and the transistor(P_T) . 4+2+4



10. Show the dc and ac equivalent circuits of a cascode amplifier. For a cascode amplifier circuit connected to a 15 V supply R_1=76 kΩ, R_2=28 kΩ, R_3=37 kΩ, R_C=5 kΩ, R_E=3 kΩ and R_L=5 kΩ, calculate the small signal voltage gain when β=150 for both transistors and V_{BE}=0.7 V. 4+6

11. What is the difference in operation between the dual input balanced output differential amplifier and the singleinput balanced output differential amplifier? 6

For β=100 for both transistors, V_{BE}=0.715 V, V_{CC}=10 V, V_{EE}=-10V, R_C=2.2 kΩ, R_E=4.7kΩ, R_{in1}=R_{in2}=50Ω, find I_{CQ} and V_{CEQ}. 4

Set IV

Answer any two questions from set 4

Marks 10x2

12. What are the dependent and independent variables in a common emitter transistor amplifier circuit? Derive expressions for the voltage gain of a transistor amplifier including and excluding the source resistance. Explain the presence of the negative sign in the expressions for the current and voltage gains. 2+6+2

13. Show the hybrid parameter circuit for a voltage divider transistor circuit. How would the circuit change if the emitter resistance is omitted? A CE amplifier uses a transistor with h_{ie}=1kΩ, h_{fe}=100,h_{re}=5x10^{-4} and h_{oe}=25x10^{-6}/Ω. The load resistance is 5kΩ. Find the current amplification and the overall voltage and power gains for a source resistance of 1kΩ. 2+2+6

14. Show the hybrid equivalent circuit for a emitter follower transistor circuit with R_S (source res) and R_L (load at output). Give the r_e model for this circuit. 4

For a CE amplifier, h_{ie}=1100Ω, h_{re}=2.5x10^{-4},h_{fe}=50, h_{oe}=24μA/V, 1/h_{oe}=40K. If R_L=10K and R_S=1K, find A_f, A_V, R_i, R_O, A_{is}, A_{vs}. 6