Semiconductor Devices - Sample Question for possible exercise

1. A BJT has a base current of 250 μA and emitter current of 15mA Determine the collector current gain and β.
2. In the circuit shown in Fig.1, [IDSS] = 4mA, Vp = 4V. Find the quiescent values of ID, VGS and VDS of the FET

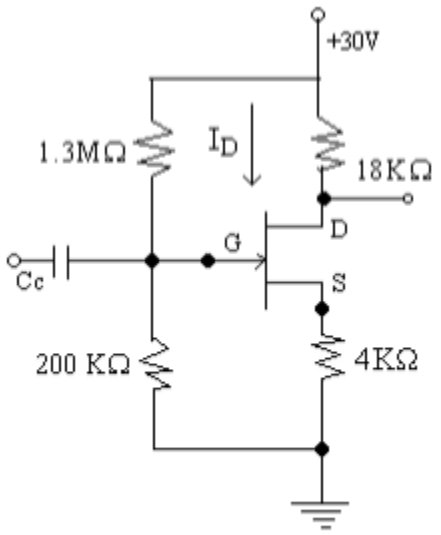
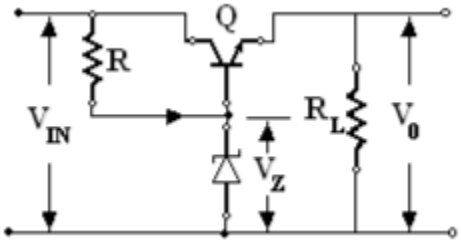


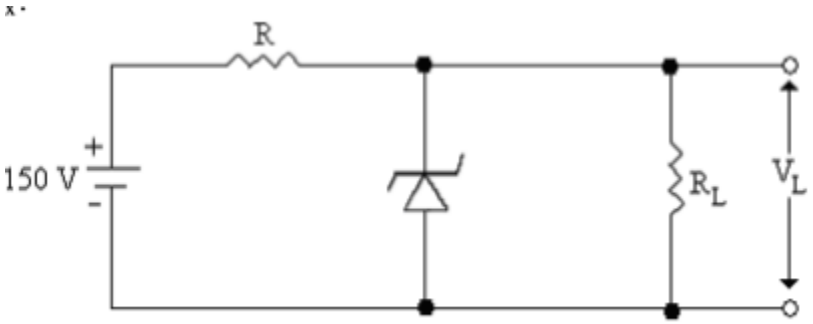
Fig.1

3. For the series regulator given below, V 15V in = , Ω = 200 R , the transistor 50 =β , LR =1.2 KΩ, z V =10V and V 0.4V BE = . Calculate (i) output voltage (ii) load current (iii) the base current in the transistor (iv) zener current.

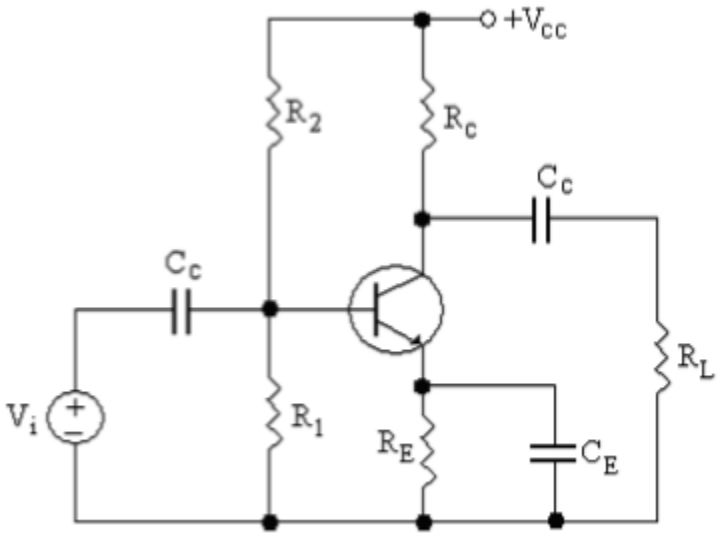


4. An intrinsic silicon bar is 4mm long and has a rectangular cross section 60x100 (μm) 2. At 300K, find the electric field intensity in the bar and voltage across the bar when a steady state current of 1μA is measured. (Resistivity of intrinsic silicon at 300K is 2.3 x 103 Ω−m
5. The current flowing through a certain P-N junction at room temperature when reverse biased is 0.15μA. Given that volt-equivalent of temperature, VT is 26mV, and the bias voltage being very large in comparison to VT, determine the current flowing through the diode when the applied voltage is 0.12V.

6. In a transistor amplifier, change of 0.025V in signal voltage causes the base current to change by 15μA and collector current by 1.2 mA. If collector and load resistances are of 6kΩ and 12kΩ, determine i) input resistance (ii) current gain iii) ac load (iv) voltage gain v) power gain
7. Explain 'Zener breakdown'. The zener diode in the circuit shown below regulates at 50V, over a range of diode currents from 5 to 40mA. The supply voltage V = 150V. Compute the value of R to allow voltage regulation from a zero load current to a maximum load current Imax. What is Imax?



8. Draw a small signal equivalent circuit for the CE amplifier shown in fig below



9. Draw the symbol and characteristics of an N-channel JFET and mark linear region, saturation region and breakdown region.
10. Draw the circuits of the various transistor configurations.
11. What is an integrator? Derive the formula for its output voltage. Explain its working with neat and clean waveform i) In case of square wave input ii) In case of sine wave input
12. Derive the formula for summing amplifier and on averaging amplifier in non Inverting configuration
13. Show an FET source follower circuit. What type of negative feedback takes place in the circuit? Analyse the circuit to derive an expression for voltage gain with feedback.
14. Write the equation, which represents the boundary between the triode region and pinch off region

15. Explain how opamp can be used as the following and derive expressions for the output
    (i) Differentiator
    (ii) (ii) Integrator
    (iii) (iii) Inverting amplifier
    (iv) (iv) Summer