EEL204 - Analog Integrated Circuits - Minor 1

Indian Institute of Technology Delhi

Time: 1 hour; Total marks: 15
Instructions

- Read the questions carefully. If the question is wrong state what is wrong and if any circuit parameter or device state is not mentioned, assume as per your convenience. Don't ask for any clarification, there is nothing to clarify!!.
- Be concise, write no more than couple of sentences for every question.

Q1. (a) Draw the direction of carriers (electrons and holes) and the current flow for forward active operation in a pnp transistor (1.5 marks).

(b) State the small signal impedances observed for transistor configurations shown in figure 1. (1.5 marks)

Q2. (a) Calculate the output voltage (V_{OUT}) for the circuit shown in figure 2. (1.5 marks).

(b) In figure 1(h), if $V_{GS} \gg V_{TH}$, then the transistor will operate in which region? (0.5 marks)

(c) Among the BJT and MOSFET, which one you think is a better VCCS and why?. (0.5 marks)

(d) State the typical relationship between the emitter doping, base doping and collector doping in a BJT transistor. (0.5 marks)
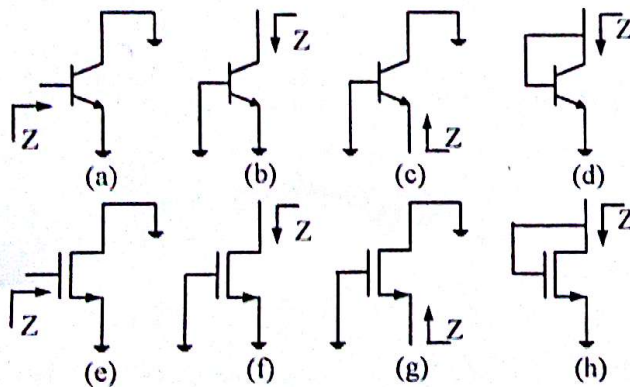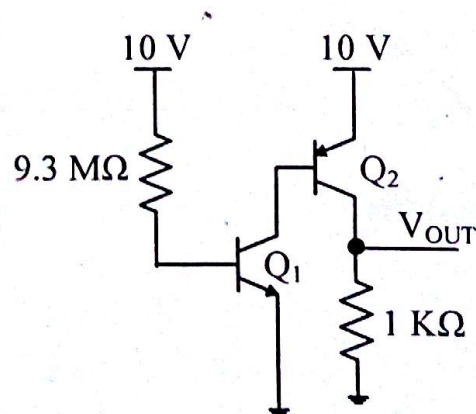

Figure 1: transistors

Figure 2: amplifier

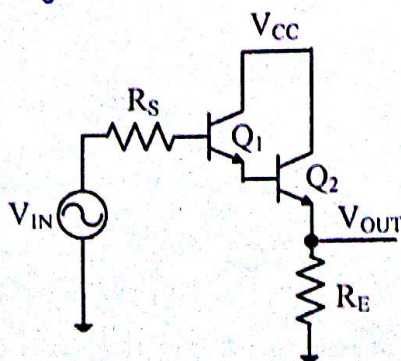Q3. (a) Draw the small signal model for the circuit shown in figure 3. (1.5 marks)

Figure 3: Amplifier

1

(b) The open circuit voltage and internal resistance of a microphone is 100mV (rms) and 100 KΩ respectively. If the input signal is amplifies by an amplifier of input resistance 100 KΩ and delivers a power of 1 W to a load of 16 Ω at the output. Determine the voltage gain of the amplifier. (1.5 marks)

Q4. (a) For the circuit shown in figure 4, state the transistor biasing condition as V_{IN} is increased from 0 to V_{DD} (1.8 V). (1.5 marks)

(b) For the circuit shown in figure 5, state the transistor biasing condition as V_{IN} is increased from 0 to V_{DD} (1.8 V). (1.5 marks)
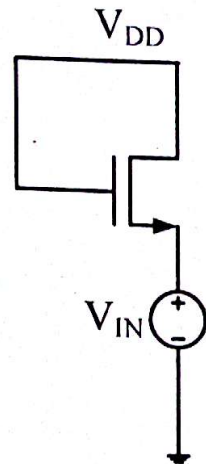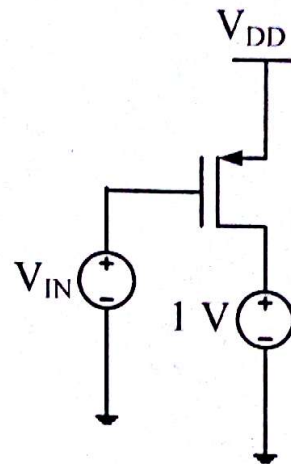
Figure 4: amplifier

Figure 5: amplifier

Q5. (a) Frame your own question worth 3 marks, justify why it should be graded for 3 marks and write the answer. Direct example questions from any textbook will not be evaluated. (3 marks)