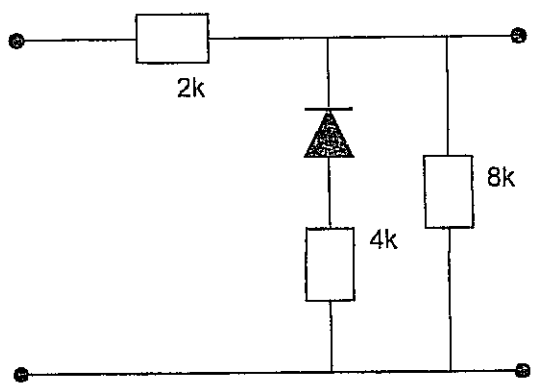
The Open University of Sri Lanka
Diploma in Technology
ECD 1201 Electronic Components and Circuits
Final Examination 2005/2006

Date : March 11th, 2006 Time : 1330 – 1630 hrs.

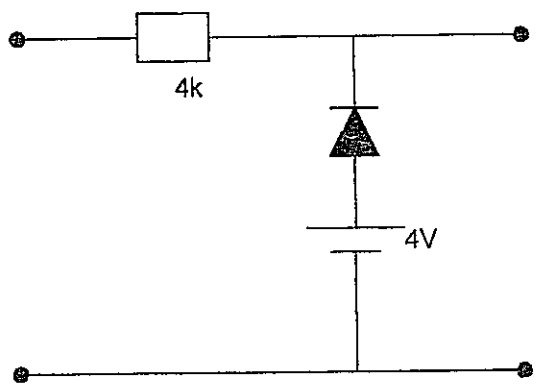
Answer 5 questions only. All questions carry equal marks.

Q1 a) Describe the behaviour of a semiconductor pn-junction, when
i) no external electric field is applied, and
ii) when an electric filed is applied across the junction using a dc battery.

b) Sketch the waveform of the output voltage v_o for the following circuits, for input voltage $v_i = 10V \sin \omega t$. Show values clearly.



i)



ii)

Q2. a) Describe the functioning principle of zener diode voltage stabiliser circuit.

b) For a typical zener diode voltage stabiliser circuit a 18V zener is used. The voltage across the load stays at 18V as long as I_z is maintained between 200mA and 2A. Find the value of R_s so that the load voltage remains constant while the input voltage varies between 22V to 28V.

Q3. a) Describe and compare full wave rectifier and bridge rectifier.

b) Describe three-phase full wave rectifier.

c) Describe briefly the smoothing action of an inductor filter and a capacitor filter.

Q4. a) Sketch and describe briefly advantages and disadvantages of biasing a CE transistor amplifier circuit with fixed bias, and collector-to-base bias.

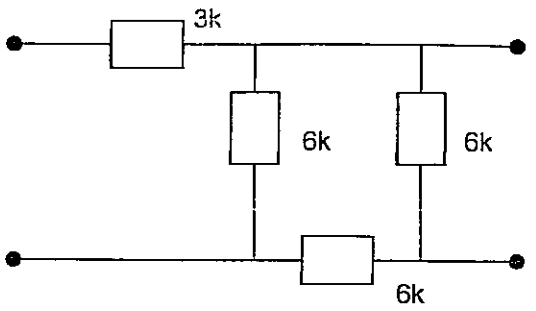
b) Sketch and explain the stabilisation provided by self-bias (emitter-bias) for a CE transistor circuit.

c) For a typical self-biased Si npn CE transistor amplifier it is given that $R_1 = 10k\Omega$, $R_2 = 5k\Omega$, $R_C = 1k\Omega$, $R_E = 2k\Omega$. V_{cc} is 15V. Coupling capacitors C_C and bypass capacitor C_E are in place. Assume $V_{BE} = 0.7V$.

i) Draw dc load line.
ii) Calculate the quiescent (Q) point.
iii) Draw ac load line.

Q5. a) Explain hybrid parameter equivalent circuit.

b) Calculate the h parameters of the circuit given in following figure.



c) For a typical self-biased Si npn CE transistor amplifier it is given that $R_1 = 80k\Omega$, $R_2 = 40k\Omega$, $R_C = 10k\Omega$, $R_E = 10k\Omega$, $R_L = 30k\Omega$. V_{CC} is 20V. Coupling capacitors C_C and bypass capacitor C_E are in place.
The h parameters of the transistor are $h_{ie} = 1.5k\Omega$, $h_{fe} = 50$, $h_{oe} = 4x10^{-4}$, and $h_{re} \approx 0$.
Find
i) ac input impedance, and ii) voltage gain for the circuit.

Q6. a) Compare unipolar and bipolar transistors.

b) Describe the types of FETs, and compare their characteristics.

c) In a n-channel JFET CS connection, biased by potential divider method, it is desired to set the operating point at (2.5mA, 8V). If $V_{DD} = 30V$, $R_1 = 1M\Omega$, and $R_2 = 500k\Omega$, find the value of R_S. The parameters of JFET are $I_{DSS} = 10mA$ and $V_{PO} = -5V$.

Q7. a) Describe the characteristics of ideal operational amplifier. Compare with practical operational amplifier.

b) Describe the *virtual earth* concept.

c) Obtain an expression for the closed loop gain of an inverting opamp circuit with an ideal operational amplifier. How does this differ with a practical operational amplifier?

d) Draw circuits of following op-amp circuits, and derive expressions for the transfer functions: i) non-inverting amp ii) integrator iii) differentiator

Q8. Write short notes on five of the following.

a) Varactor diode
b) Tunnel diode
c) Thermistor
d) Klystron
e) Magnetron
f) Laser