CALEDONIAN COLLEGE OF ENGINEERING, OMAN

Session: 2001 – '02

DIET: Re-sit

Level: 2

Module Leader: Ali M. A

12 August 2002

Duration: TWO Hours

ANALOGUE ELECTRONICS
(ENGE 254)

CANDIDATES SHOULD ATTEMPT 4 QUESTIONS

PLEASE READ THE QUESTIONS CAREFULLY

MATERIALS TO BE SUPPLIED/ALLOWED:

Question paper (Supplied)
Blank Examination Script (Supplied)
Non-programmable calculator (Allowed)

Q 1*(a)* Explain what is meant by the saturation region, active region and cut off region biasing of a transistor. [7]

(b) For the transistor circuit shown in figure Q1(b), collector current Ic = 2mA, Vce = 10V, R2 = 18 kΩ, Re = 1.2 kΩ and β_{dc} = 100. Determine the values of R1 and Rc. [10]

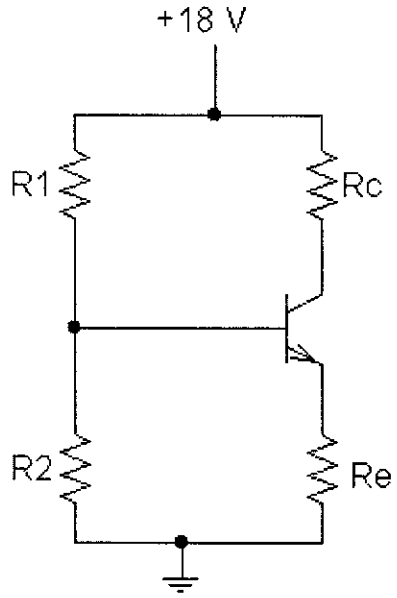

Figure Q1(b)

(c) Draw the circuit of a tuned amplifier, show its frequency response and mark the 3dB frequencies on it. [8]

Q 2*(a)* Draw the h-parameter equivalent circuit of a CE transistor amplifier configuration and define the four h-parameters. [8]

(b) For a common emitter transistor amplifier h_{ie} = 2000 Ω, h_{fe}= 100, h_{re}= 1.8 × 10^{-4}, h_{oe}= 10μSiemens, load resistance is 2000 Ω. Find its current gain, voltage gain and input impedance. Given that $A_I = -h_{fe}/(1+h_{oe}R_L)$ $R_i = h_{ie}+h_{re}A_IR_L$ and $A_V = A_I R_L/R_i$ [9]

(c) Explain the working of an N-channel JFET. Give a sketch of its drain characteristics. [8]

Q 3*(a)* State the Barkhausen criteria for sustained oscillation. [6]

(b) Draw the circuit of a Hartley oscillator. Write down the expression for its frequency of oscillation. [9]

(c) In an oscillator circuit the feed back factor β is 1/29 and the phase shift around the closed loop is 0°. Find the gain required by the amplifier for sustained oscillation. [4]

(d) Draw the circuit of an oscillator which uses an RC circuit in its feedback network. [6]

Q 4*(a)* Draw the frequency response of a band pass filter and a high pass filter and mark the critical frequencies on it. [6]

(b) For the filter shown in figure Q4(b) determine the critical frequency. Give the order of the filter and state whether it is a low pass filter or high pass filter. [6]

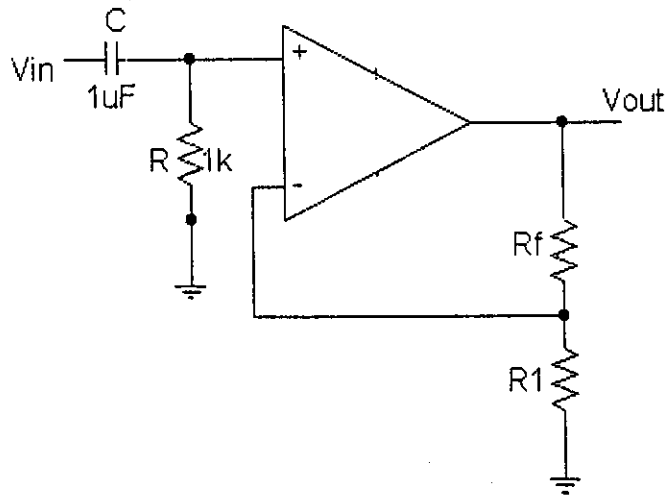

Figure Q4(b)

(c) Give the circuit diagram of a Sallen-key second order low pass filter and write down the expression for its critical frequency. [10]

(d) Give the roll off rates of first order and second order Butterworth filters [3]

Q5 *(a)* Draw the circuit diagram of a non-inverting amplifier and an inverting amplifier using an op-amp and give the expression for the voltage gain. [8]

(b) Draw the circuit of an differentiator using op-amp and draw its output wave form for a square wave input. [5]

(c) *(i)* What is meant by voltage offset nulling? [4]

(ii) Discuss two methods of offset nulling which might be used with a 741 operational amplifier. [4]

(d) Draw the circuit of a voltage follower using op-amp. [4]

Q6 *(a)* List four advantages of 555 timer IC. [6]

(b) Explain the working of a LED, draw its light output versus current characteristics and circuit symbol. [9]

(c) For the astable multivibrator circuit shown in fifure Q6© draw the voltage wave form at Vc and Vout. Determine the time periods and voltage levels of the output waveform [10]

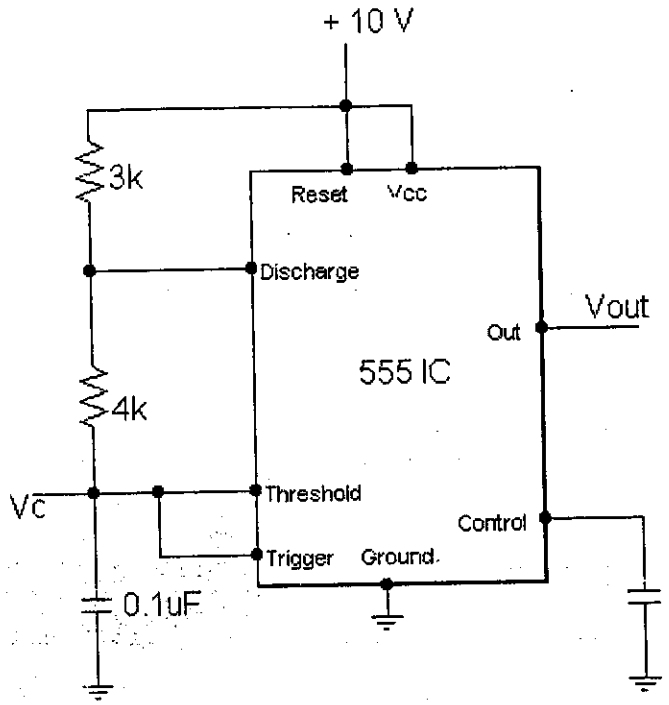

Figure Q6(c)

END OF QUESTION PAPER