



**CALEDONIAN COLLEGE OF ENGINEERING, OMAN**

**Programme: B. Sc (Honours) in Electronic Engineering  
B. Sc (Honours) in Telecommunication Engineering**

**Session : 2004 - '05**

**DIET : Second**

**Level : II**

**Module Leader : Ali M. A**

**August 2005**

**Duration : TWO Hours**

**Analogue Electronics  
(ENGE 254)**

**CANDIDATES SHOULD ATTEMPT ANY FOUR FULL 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) With necessary diagrams explain the working of an *npn* transistor as a switch. [8]

(b) Define  $\alpha_{dc}$  and  $\beta_{dc}$  for a transistor. Derive the relationship between them. [7]

(c) Sketch the h-parameter equivalent circuit for the circuit shown in Figure Q1 (c). [7]

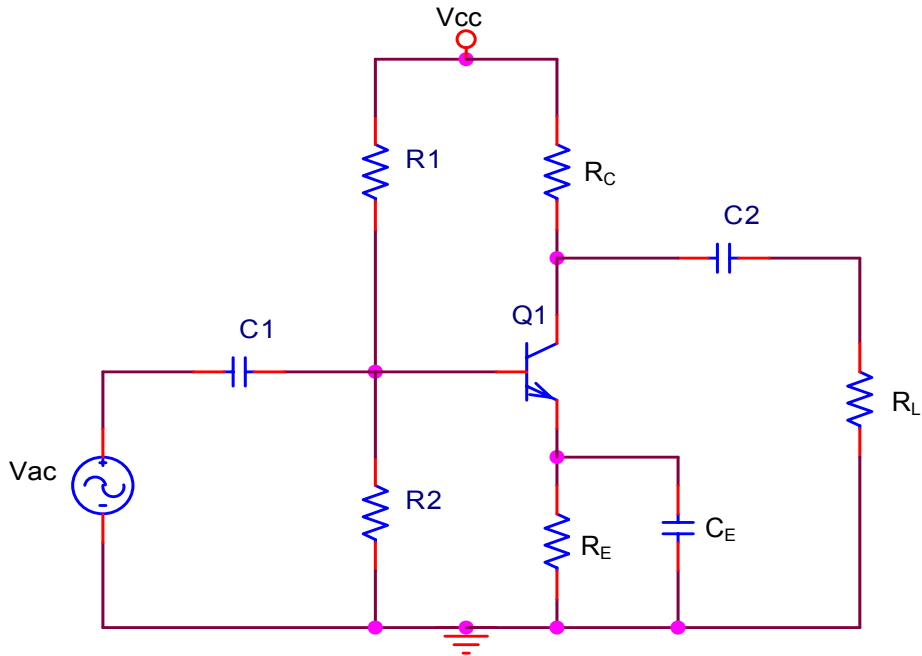


Figure Q1(c)

(d) For a transistor  $I_B = 50\mu A$  and  $I_C = 3\text{ mA}$  determine its  $I_E$ , and  $\beta_{dc}$ . [3]

- Q 2(a) Draw a simple block diagram for a feedback oscillator and state the conditions required for sustained oscillation. [7]
- (b) Sketch the circuit diagram of an RC phase shift oscillator and explain how the Barkhausen criteria are satisfied in it. [10]
- (c) Identify the oscillator circuit shown in Figure Q2(c). Find the values of  $L_a$ ,  $L_b$  and  $C$  such that the frequency of oscillation is 100kHz, assume the voltage gain of the amplifier circuit is equal to 10. [8]

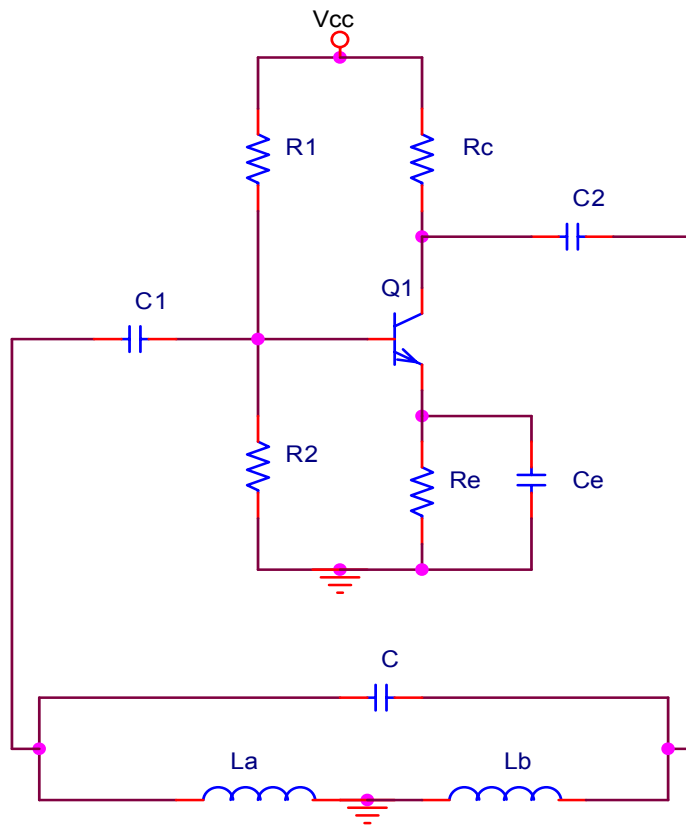


Figure Q2(c)

- Q 3(a) With the aid of equations and circuit diagrams explain the operation and applications of tuned amplifiers. Draw the frequency response curve of a tuned amplifier and mark its center frequency. [9]
- (b) Give four characteristics of a common collector amplifier circuit. [4]
- (c) Define the terms *transconductance* and *drain resistance* for a junction field-effect transistor. [3]
- (d) With necessary sketches explain the working of an n-channel depletion MOSFET. Draw its drain characteristics. [9]

- Q 4(a) Give four important characteristics of an ideal operational amplifier. [4]
- (b) Define the terms *CMRR* and *input bias current* related to an operational amplifier. [4]
- (c) Draw the circuit diagram of an integrator using an operational amplifier and give the expression for its output voltage. Draw its output waveform for a square-wave input. [8]
- (d) Find the value of the output voltage for the circuit shown in Figure Q4(d).  $V_{in1} = 1\text{mV}$ ,  $V_{in2} = 0.5\text{mV}$  and  $V_{in3} = 0.4\text{mV}$ . [9]

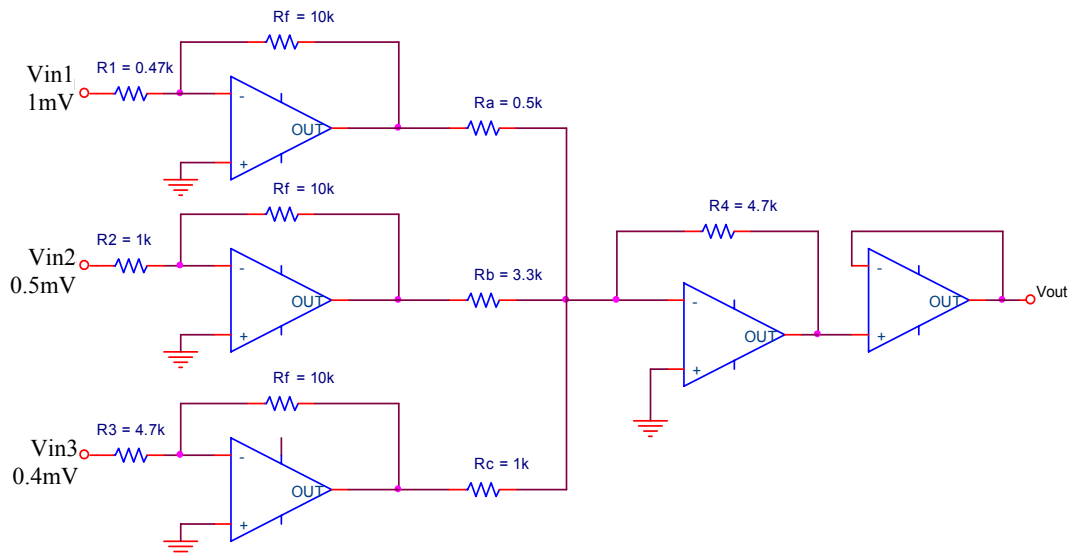
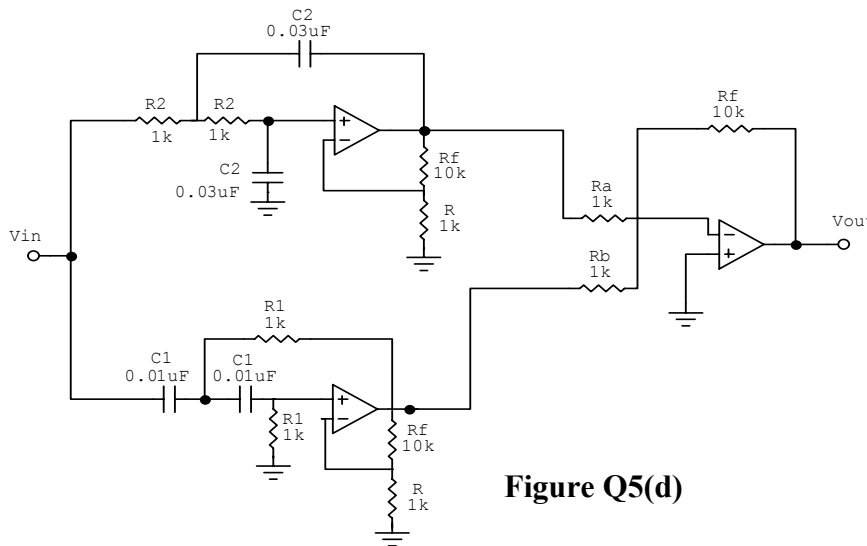
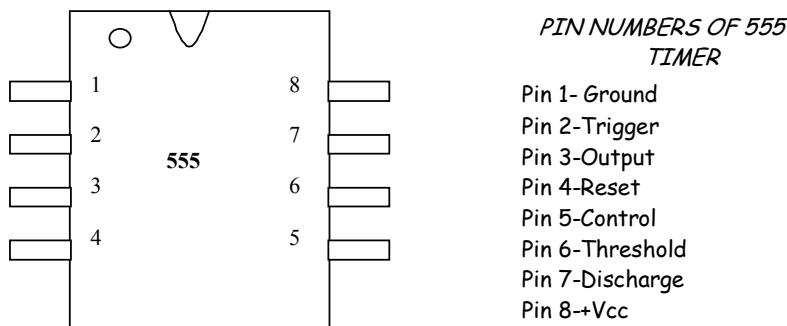


Figure Q4(d)

- Q 5(a) Sketch the Butterworth and Chebyshev filter response curves for a LPF. Give one advantage and disadvantage of a Chebyshev filter. [5]
- (b) With a block diagram explain how a *band pass filter* can be realized using LPF and HPF. [6]
- (c) Design a first order low pass filter with a cut off frequency of 10 kHz and a pass band gain of 4. [7]
- (d) Identify the circuit shown in Figure Q5 (d). Calculate the stop band and the center frequency. Sketch the frequency response of the circuit. [7]



- Q 6(a) Pin details of a 555 timer IC are shown in Figure 6(a). Sketch the circuit diagram of an astable multi-vibrator using the 555 IC and explain its operation. Draw the voltage waveforms, at key points, in the circuit. [14]



**Figure 6(a)**

- (b) Explain the 'dark current' of a photo diode. Sketch the biasing arrangement and characteristics of photo diode. [6]
- (c) Briefly explain the principle of light transmission in optical fibers with necessary sketches. [5]

**END OF QUESTION PAPER**