



CALEDONIAN COLLEGE OF ENGINEERING, OMAN

Session : 2003 – '04

DIET :

Level : II

Module Leader :

May 2004

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)

- Q1 (a) (i) Sketch the circuit diagram of a common emitter amplifier using an npn transistor. [4]
(ii) Explain the function of the base, collector resistors and coupling capacitors. [3]
- (b) (i) Explain with the aid of equations and sketches the meaning of biasing and DC load line. [4]
(ii) Explain how a common emitter transistor configuration can be used as an amplifier in terms of quiescent conditions. [3]
- (c) The base bias circuit shown in Fig. Q1-c is subjected to an increase in temperature from 25°C to 75°C if $\beta_{DC} = 100$ at 25°C and 150 at 75°C. Determine the percent change in Q-point values (I_C and V_{CE}) over the temperature range. Neglect any change in V_{BE} and the effect of any leakage current. [11]

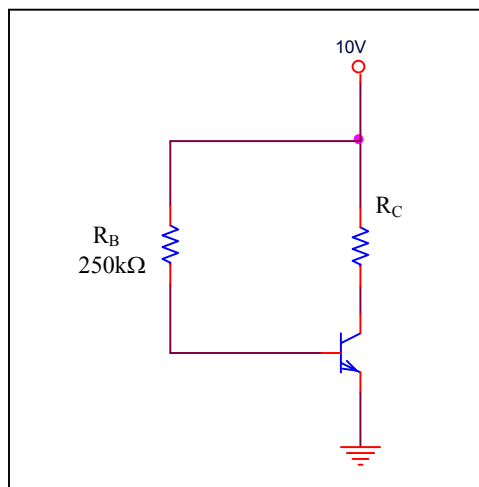


Fig.Q1-c

- Q2 (a) Calculate the value of R_C and R_2 that will force the transistor shown in Fig.Q2-a in to saturation. Assume $I_{Csat} = 2.3\text{mA}$. [10]

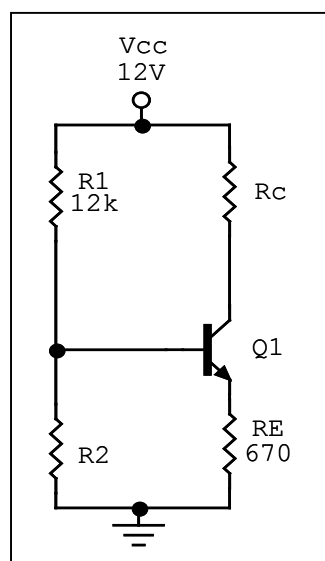


Fig.Q2-a

[7]

(b) Sketch the h-parameter equivalent model for the circuit shown in Fig.Q2-b.

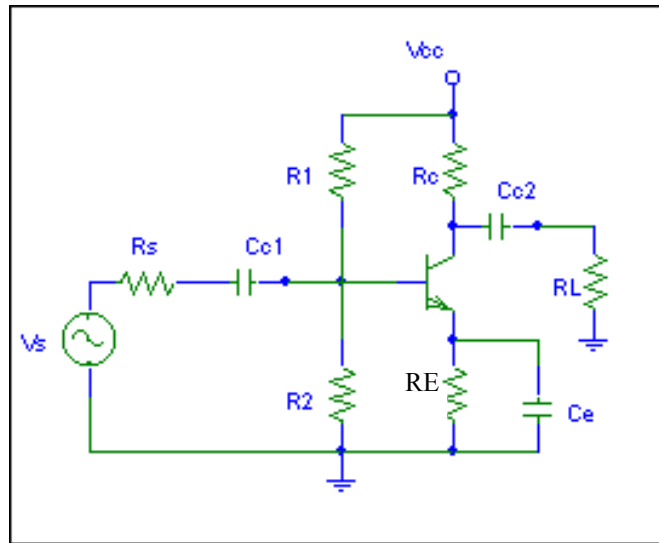


Fig.Q2-b

(c) With the aid of diagrams explain the operation of an N-channel Field Effect Transistor. [8]

Q3 (a) For the oscillator circuit shown in Fig.Q3-a, determine the type of oscillator and the frequency of oscillation. Assume there is a negligible loading on the feedback circuit and that Q is greater than 10. [7]

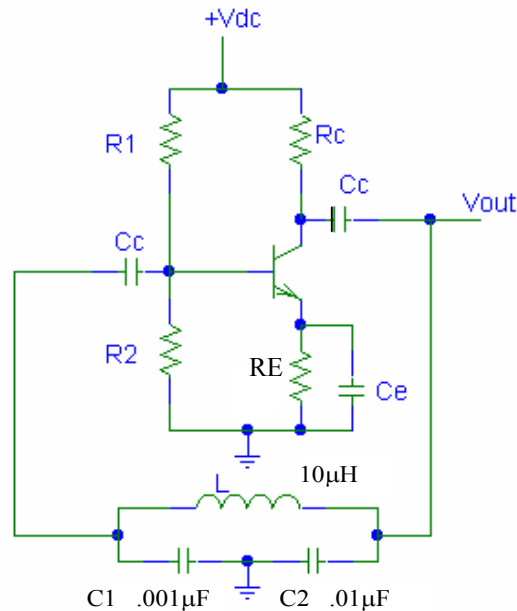


Fig.Q3-a

- (b) (i) State the main disadvantage of the RC phase shift oscillator and explain how to overcome this disadvantage. [4]
- (ii) Compare the type of applications in which the RC oscillators are used with the type of applications in which LC oscillators are used. [4]
- (c) Sketch the circuit diagram of an RC phase shift oscillator and explain how the Barkhausen criterion is satisfied in it. [10]

- Q4 (a) State the characteristics of an ideal op-amp. [6]
- (b) The slew rate of an op-amp is $2\text{V}/\mu\text{s}$. calculate the response time of the op-amp for a change in the input from -2V to 4V . [7]
- (c) Design an inverting summing amplifier to give the average of three inputs at the output. Sketch the circuit diagram. [12]
- Q5 (a) State the advantages and disadvantages of Chebyshev filter response over Butterworth filter response. [7]
- (b) The center frequency of a certain band pass filter is 16 kHz and the Q factor is 18. Determine the bandwidth and classify the filter as narrow band or wide band. [6]
- (c) Design a first order band pass filter to have lower cutoff frequency equal to 10kHz and upper cutoff frequency equal to 100kHz . Sketch the filter circuit and the frequency response. [12]
- Q6 (a) State the advantages of the 555 timer IC. [6]
- (b) Sketch the internal diagram of the 555 timer IC. [6]
- (c) Sketch the waveforms of the output and the voltage across the capacitor of an astable multivibrator using the 555 timer IC. [6]
- (d) Explain the working of a light emitting diode. [7]

END OF QUESTION PAPER