



Final Examination 2016-2017

Subject: Communication Electronic

Date: / / 2017

Divisions: All Divisions

Time: 3 Hours

Year: Second

Examiner: Dr. Ali O. Abid Noor

Number of pages: 2

Attempt Four questions only

**Q1. (a)** Design a 4-pole Sallen-Key BPF with the following specifications: Center frequency = 4.95kHz; Bandwidth= 3.84kHz; Butterworth response. Given that the feedback resistors ratios are as shown in the table below. Choose  $R = 1k\Omega$ . **(10 marks)**

**(b)** Draw the frequency response (in dB) of the filter in part (a) showing the center frequency, sideband frequencies and the roll-off rate of the filter. **(5 marks)**

Order	1 <sup>st</sup> stage		2 <sup>nd</sup> stage	
	Poles	Feedback Ratio	Poles	Feedback Ratio
2	2	0.586	-	-
3	2	1	1	1
4	2	0.152	2	1.235

**Q2.** For the tuned class C amplifier shown in Figure Q2,

**(a)** Show with aid of diagrams the first three stages of the action of the resonance circuit starting from the static stage. **(6 marks)**

**(b)** Determine the resonance frequency of the amplifier. Given that  $L = 100mH$ ,  $C_2 = 0.001\mu F$  **(3 marks)**

**(c)** Determine the efficiency of the amplifier if  $V_{cc} = 15V$  and it is on for 20% of the input cycle, given that  $I_{c(sat)} = 25mA$ ,  $v_{ce(sat)} = 0.18V$  and the equivalent parallel resistance in the collector tank is  $50\Omega$ . **(6 marks)**

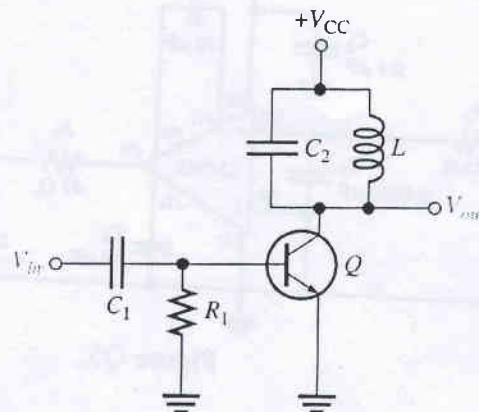


Figure Q2.

Q3. (a) An audio signal lies between 100Hz and 10kHz is used to modulate a carrier signal of 1 MHz using a standard AM modulator. Draw a circuit diagram to produce a high level AM using a collector modulator. (5 marks)

(b) If a superheterodyne receiver is used to receive the signal in part (a), determine the input and output frequencies of the IF amplifier showing the frequency spectrum. (6 marks)

(c) Suggest a suitable demodulator circuit to recover the original audio signal. (4 marks)

Q4. (a) Explain with the aid of a block diagram the operation of a PLL circuit. (7 marks)

(b) The PLL circuit shown in Figure Q4 is used as FM demodulator. Determine the following: The free running frequency, the lock range and the capture range. Suggest how to increase the capture range of the circuit.

Given:  $C_1 = 330 \text{ pF}$ ,  $C_2 = 0.22 \mu\text{F}$ ,  $R_1 = 3.9 \text{ k}\Omega$  and the supply voltage =  $\pm 9 \text{ V}$ .

(8 marks)

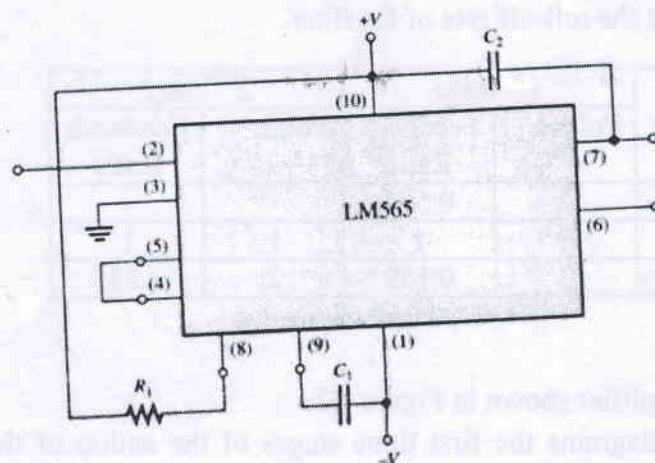


Figure Q4

Q5. (a) State the function of the components of the audio amplifier shown in Figure Q5 and determine the maximum and the minimum output voltages for the audio power amplifier if the input voltage from the detector is 10 mV rms. Given the gain of the LM386 is 200. (10 marks)

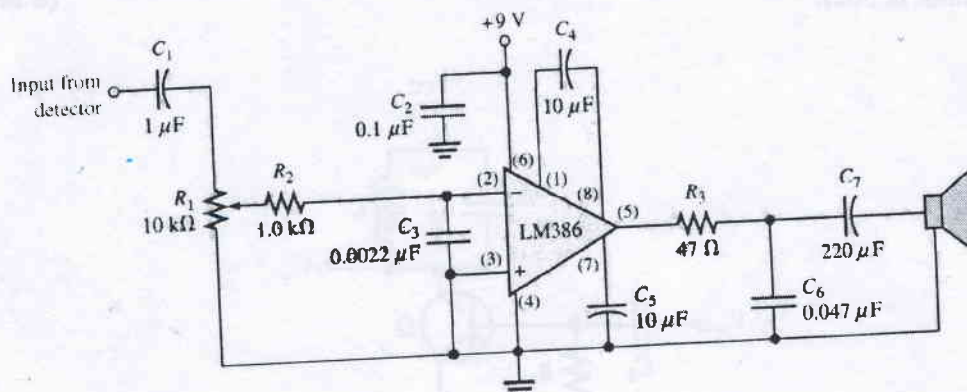


Figure Q5.

(b) Discuss with aid of block diagrams the difference between PCM and delta modulation showing the input and the output of a delta modulator. (5 marks)