B.Tech. – VIEP – ELECTRONICS AND COMMUNICATION ENGINEERING (BTECVI)

Term-End Examination

00293

December, 2016

BIEL-002 : ANALOG AND INTEGRATED CIRCUITS DESIGN

Time : 3 hours   *Maximum Marks : 70*

*Note : Attempt any **seven** questions. All questions carry equal marks. Missing data may be suitably assumed and mentioned. Use of scientific calculators is permitted.*

1. (a) For the current-mirror circuit shown in Figure 1, prove that the current ratio (I_2/I_1) is given as

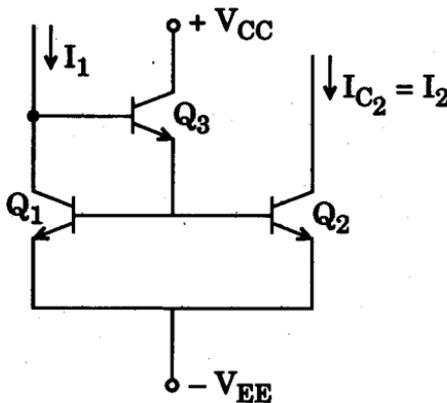$$\left(\frac{I_2}{I_1}\right) = \frac{\beta\,(\beta+1)}{\beta\,(\beta+1)+2}.$$ 5

Figure 1

(b) What are the reasons for using level-shifter in an IC op-amp ? Explain the operation of a level-shifter with the help of a neat diagram. 5

2. Draw the circuit diagram of a differential amplifier with active load. Explain its operation. What do you mean by complementary emitter-follower circuit employed in output stage ? Discuss it. 10

3. Explain the operation of a difference amplifier using three op-amps. Derive an expression for its output voltage and discuss how it can be used as an instrumentation amplifier. 10

4. Explain the use of current-to-voltage converter as a digital-to-analog converter. 10

5. (a) Find V_0 for the circuit shown in Figure 2. 5
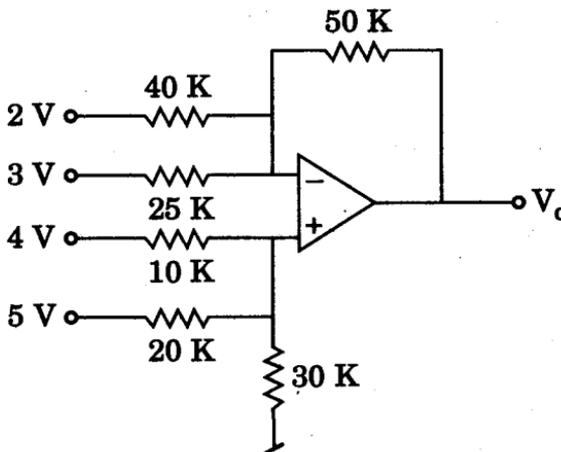

Figure 2

(b)   Explain the operation of a positive peak detector with the help of a neatly labelled circuit diagram.   *5*

6.   Draw and explain the operation of an RC phase-shift oscillator and deduce the necessary condition and frequency of oscillation.   *10*

7.   Explain the operation of an op-amp as a monostable multivibrator. Also derive an expression for the time-period of the output waveform. Under what conditions does the time-period become

$$T = 0.693 \, RC \, ?$$ *10*

8.   Draw the circuit diagram of a second-order Sallen-key Band-pass filter. Derive an expression for its transfer function and calculate various filter parameters.   *10*

9.   Explain the operation of V/F and F/V converters.   *10*

10.   Write short notes on any *two* of the following :   *2×5=10*

(a)   Analog Multipliers

(b)   PLL as an AM Demodulator

(c)   Monolithic Timers