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BIEEE-012

B.Tech. – VIEP – ELECTRICAL ENGINEERING (BTELVI)

Term-End Examination

00699

December, 2017

BIEEE-012 : ACTIVE FILTER DESIGN

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any* ***seven*** *questions. All questions carry equal marks. Use of scientific calculator is permitted. Symbols have their usual meanings.*

1. For the circuit shown in Figure 1, find the transfer function V_2/V_1. Investigate the changes in the transfer function caused by an op-amp with finite gain $A = \omega_t / s$. *10*

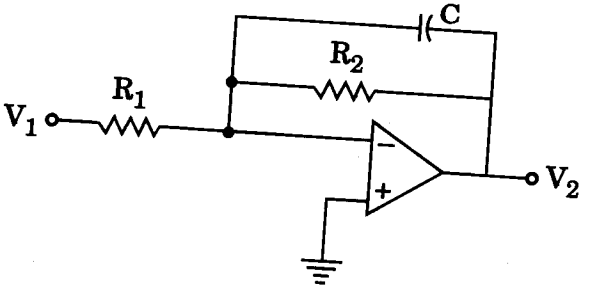

Figure 1

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

   (a) KHN Biquad

   (b) Tow-Thomas Biquad

   (c) Negative Resistors

3. Show that the order of the Chebyshev filter to satisfy a set of specifications is always lower than that of the corresponding Butterworth filter. *10*

4. Design a first-order high pass passive filter with zero dc gain and the attenuation is at least 12 dB for f < 15·6 kHz. Also explain leapfrog filters. *10*

5. Explain how can one change a low-pass filter through RC-CR transformation. *10*

6. A Tow-Thomas biquad filter is designed for the parameter f_0 = 3·6 kHz, ϕ = 4 and dc gain of 7 dB. Estimate the minimum gain bandwidth product the op-amp must have, if the errors in frequency can't be larger than 1% and quality factor error not more than 2%. *10*

7. A maximally flat magnitude transfer function is characterized by the parameter ξ = 0·075 and u = 7. Determine the minimum attenuation at the stopband frequency ω_s = 1·85 ω_p. Assume f_p = 980 Hz. Design a test Sallen-Key filter using suitable op-amps. *10*

8. Determine the inverse Chebyshev magnitude response and location of poles and zeros. *10*

9. Design a switched capacitor first-order circuit that has a low frequency gain of + 10 and a – 3 dB frequency of 1 kHz. Give the values of the capacitor ratios α_1 and α_2. *10*

10. A Sallen-Key low pass filter is designed for the parameters f_c = 4·8 kHz, Q = 5 and dc gain H = 3. Estimate the errors in filter parameters if the circuit is to be built with an LM741 op-amp. *10*
