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L 1077

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2006.

Fourth Semester

Electronics and Communication Engineering

EC 1254 — LINEAR INTEGRATED CIRCUITS

(Common to B.E. (P.T.) R – 2005 Third Semester Electronics and Computer Engineering)

Time : Three hours | Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. For the difference amplifier shown in Fig. 1. Calculate V_{C1} and V_{C2} if $V_1 = V_2 = 0$ V. Assume $V_{be} = 0$ V.

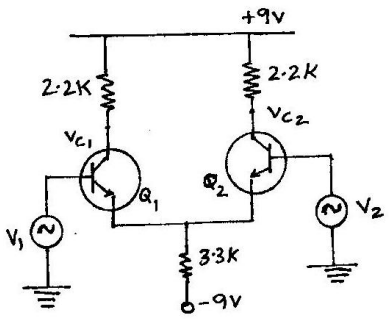

Fig. 1

2. In response to a square wave input, the output of an op–amp changed from –3 V to + 3 V over a time interval of 0.25 μs. Determine the slew rate of the op–amp.

3. Draw the circuit of a voltage follower using op–amp and prove that its gain is exactly equal to unity.

4. An AC signal has got a magnitude of 0.1 volt peak to peak. Suggest a suitable half wave rectifier for this signal.

5. Draw the block diagram of a multiplier using log and antilog amplifiers.

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6. State why the phase detector output in a PLL should be followed by a low pass filter.

7. An 8 bit D/A converter has an output voltage range of 0 – 2.55 V. Calculate its resolution.

8. Calculate the number of comparators required for realizing a 4 bit flash A/D converter.

9. Draw the internal block diagram of an IC voltage regulator.

10. Draw the circuit of a switched capacitor integrator.

PART B — (5 × 16 = 80 marks)

11. (i) Draw the circuit of Widlar current source and derive an expression for its output current.

(ii) Calculate the output of the circuit shown in Fig. 2.

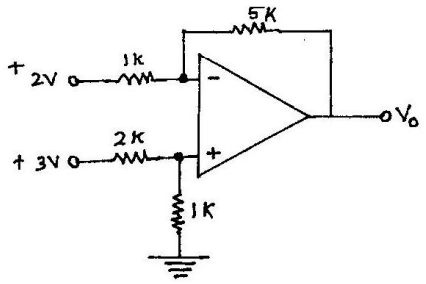

Fig. 2

(iii) Write the differential equation for the output $v_0(t)$ of the circuit shown in Fig. 3.

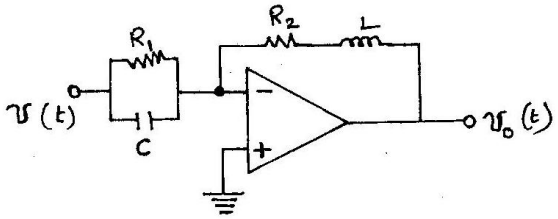

Fig. 3

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12. (a) (i) Draw the circuit of a second order Butterworth active low pass filter and derive its transfer function.

(ii) Design a second order active low pass filter for a cut-off frequency of 1 kHz.

Or

(b) (i) Draw the circuit of an astable multivibrator using operational amplifier and derive an expression for its frequency of oscillation.

(ii) Using 741 op–amp design an astable multivibrator for a frequency of 1 kHz.

13. (a) With circuit diagram describe the working of Gilbert multiplier cell. Explain how a frequency doubler can be realized using this cell.

Or

(b) (i) Draw the block diagram of a PLL and derive an expression for its closed loop transfer function.

(ii) Draw the block diagram of the circuit that converts 1 kHz to 10 kHz.

14. (a) (i) Draw the diagram of sample and hold circuit. State how will you reduce its hold mode droop.

(ii) Design a 4 bit binary weighted resistor D/A converter for the following specifications. Use LM741 op-amp.

R = 10 K, V_{ref} = 2.5 V. Full scale output = 5 V.

Or

(b) (i) With neat diagrams explain the working of dual slope A/D converter.

(ii) A dual slope ADC has a full scale input of 2 Volts. It uses an integrating time of 10 ms and integrating capacitor of 0.1 μF. The maximum magnitude of the integrator output should not exceed 3 Volt. Calculate the value of the integrating resistor.

15. (a) Draw the internal block diagram of NE 555 timer IC and explain how it can be used as monostable multivibrator. Derive an expression for its pulse width.

Or

(b) With neat diagram explain the working of step down switching regulator.
