Question Paper

Exam Date & Time: 04-Jun-2018 (09:30 AM - 12:30 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

INTERNATIONAL CENTRE FOR APPLIED SCIENCES
IV SEMESTER B.S. DEGREE MAKE-UP EXAMINATION-MAY/JUNE 2018
DATE: 4 JUNE 2018
TIME: 9.30 AM TO 12.30 PM
IC Systems [EC 243A]

Marks: 100 **Duration: 180 mins.**

Answer 5 out of 8 questions.

1) A) Identify and draw the constant current biasing circuit from the **Fig. Q1A.** Discuss its significance. With necessary analysis and assumption, show that current I0 has a constant value. Draw the circuit diagram of differential amplifier with current mirror circuit and derive the necessary equations. (10)

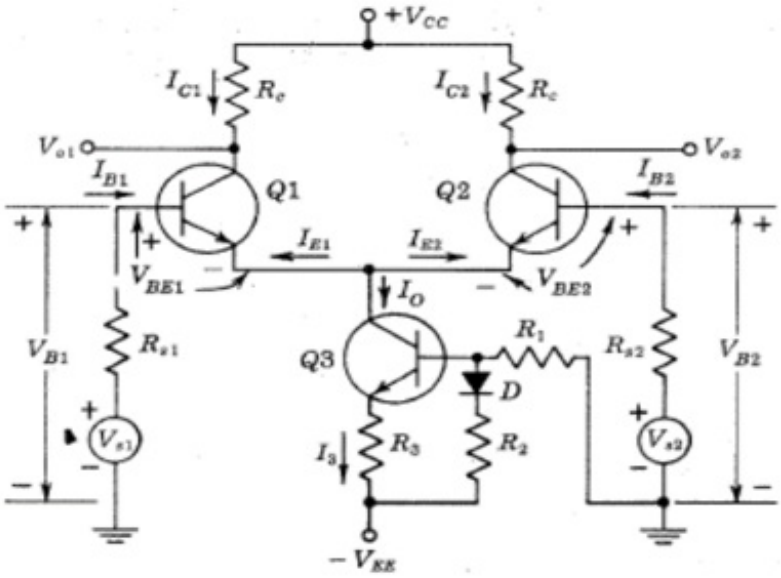

Fig. Q1A

B) Draw the circuit diagrams of V to I converter with Floating and Grounded load using OP-AMP. Derive the expressions (10)

for load current.

2) A) Explain the methods to measure the following OP-AMP parameters. (10)
i) Open loop differential gain
ii) Input resistance
iii) Output resistance
iv) Input OFFSET voltage

B) i) List the four types of feedback configurations and draw its block diagram. (10)
ii) If the differential voltage gain and the common mode voltage gain of a differential amplifier are 48 dB and 2 dB respectively, find its CMRR.
iii) Draw the circuit diagram of OP-AMP based inverting averager. Write the output voltage expression for 'n' number of inputs.
iv) What is Barkhausan criterion?

3) A) i) For the circuit shown in **Fig. Q3A (i)**, (a) find the output voltage if V_1 = - 0.5V and V_2 = 0.5V. For the OP-AMPS, ± V_{SAT} = ± 12V (b) State the function of each amplifier in the circuit. (10)
ii) Analyze and determine the expression of the output voltage for the circuit shown in **Fig. Q3A(ii) & Q3A(iii).**

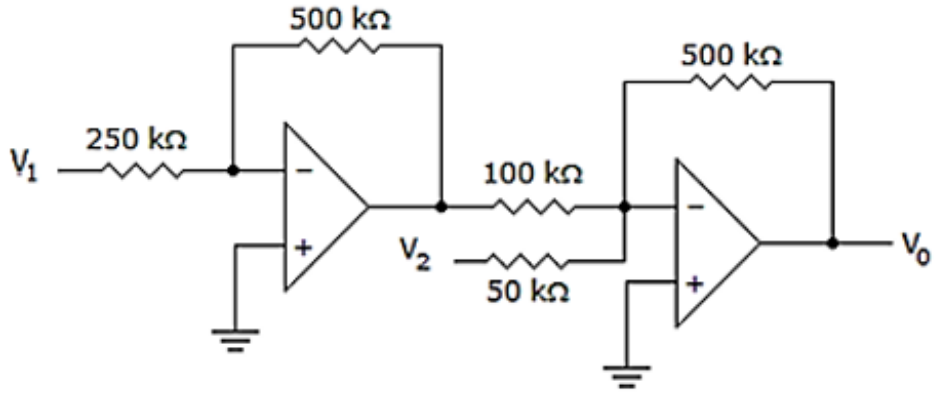

Fig. Q3A (i)

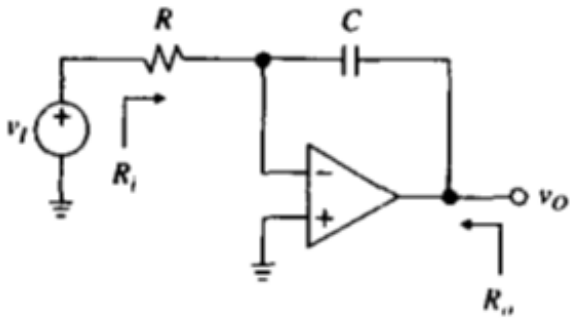

Fig. Q3A (iii)

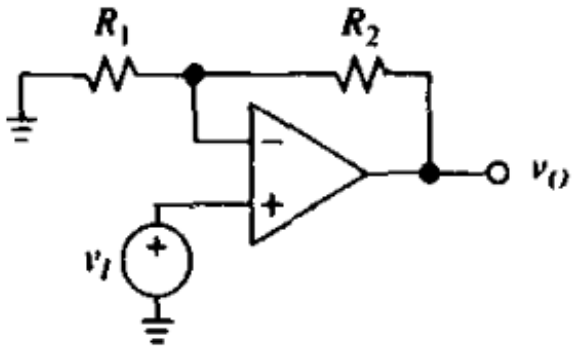

Fig. Q3A (ii)

B) Draw the circuit diagrams of V to I converter with Floating and Grounded load using OP-AMP. Derive the expressions for load current. (10)

4) With neat circuit diagram explain an OP-AMP based bridge amplifier. Derive relevant equations. Also determine the output voltage for the given specifications: (10)

A) Amplifier gain is 5. Bridge resistors $R_A = R_B = R_C = R_T = 1k\Omega$.Change in resistance of transducer is 200Ω. Bridge supply voltage is 10V. OP-AMP supply voltage is $\pm$12V.

B) Write the necessary conditions to realize Band Reject Filter using Low Pass Filter and High Pass Filter. Design a wide band reject filter using first order high pass filter and low pass filter having f_H = 200 Hz and f_L = 1 kHz. Pass band gain must be 2. Assume capacitors are 0.01μF. Find central frequency and plot the frequency response with correct labelling. (10)

5) Draw the circuit diagram of OP-AMP based square wave generator. Derive the expression for frequency of oscillation and explain its working principle. What is the peak to peak voltage at the output of this circuit? Modify this circuit to limit the output voltage using zener diodes. In (10)

A)

the circuit, if $R_1 = R_2 = R = 1K\Omega$, f = 1 KHz, $\pm V_{SAT} = \pm$ 10V, sketch the output voltage and the voltage waveform across the capacitor by marking all the timing and voltage levels.

B) Draw the circuit diagram of 4-bit binary weighted resistor DAC and explain its operation. Convert the following input into equivalent analog output. i) 0001 ii) 0011 iii) 1111. Use R=10kΩ, RF = 1kΩ. List the names of other DACs. (10)

6) Draw the functional diagram of 555 timer and explain its operation. Explain the function of following pin no's 4, 5, 6 and 7. (10)

A)

B) What is PLL? Give the applications of PLL. Draw the block diagram of IC565 & explain the working of each block. How it is used as frequency multiplier? (10)

7) Draw the circuit diagram of Log and Anti-Log amplifiers using OP-AMP. Derive the output voltage expressions. (10)

A)

B) Draw the circuit diagram of OP-AMP based series voltage regulator and adjustable regulator. Explain its operation and derive the output voltage expression. (10)

8) Explain the following with circuit diagram, waveforms and expressions: (20)

A)

A. Precision Half wave rectifier
B. Inverting Schmitt trigger
C. Peak detector
D. Analog Divider (5*4=20)

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