QUIZ 3 in ECE 101: Basics of Electrical and Electronic Circuits (25th Oct. 2024)

Write: YOUR NAME:_____ Roll No:_____

Answer all 3 questions. They carry 5 marks each.. (Total: 15 marks) Time allowed: 45 minutes.

Use back side of this sheet for rough work (rough work will not be evaluated).

(Q1) Look carefully at the circuit in Fig.1. The OP-AMPs are ideal and the supply (V_{CC}) voltages are +15 V and -15V (while ground potential is at zero volt). An ideal dc voltage source (V) of 4 volts is connected as shown. Note the magnitudes of various resistances and the points (1 to 5) at which the steady state magnitudes of voltages are to be found. Write the magnitudes of voltages at different points in the space provided below. Write the answers sequentially, first, answer for point 1, then for point 2 and so on.

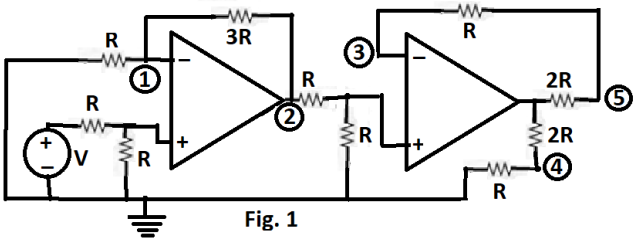


Fig. 1

Your answer: **(1)** ..... V **(2)**..... V

(3) ..... V **(4)**..... V **(5)** V

(Q2) The circuit of Fig.2 uses ideal OP-AMP with suitable supply voltages such that the OP-AMP's output does not saturate. The non-inverting pin of OP-AMP may be connected to either ground (i.e., zero potential) or to 5 V source as indicated in the figure. The output voltage 'V_0' is to be calculated for both cases. Take V_1 = 4V, V_2 = 6V, R_1 = 1 kΩ, R_2 = 2 kΩ, R_3 = 4 kΩ and R_f = 500 Ω.

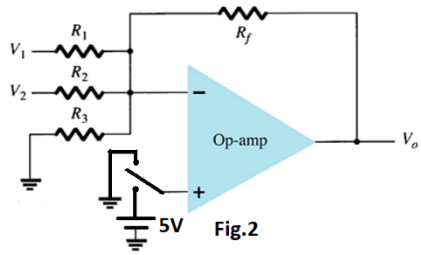


Fig.2

Write the magnitude of V_0 along with **its polarity** (+ or -) when:

(1) Non inverting pin is connected to ground. Your answer: V

(2) Non inverting pin is connected to 5V. Your answer: V

(Q3) Fig.3 shows an ideal OP-AMP circuit with input v_1 (t) and output v_0 (t). The v_1 (t) waveform has been drawn below where time (horizontal axis) has been shown in mili-seconds. The vertical axis shows instantaneous voltage in volts. Plot the waveform of v_0 (t) superimposed on the given input waveform. Neglect the smaller graph (which may be used only if you need to revise your answer). Take C = 10 micro-farad and R = 1 Kilo-Ohm. Capacitor's initial voltage (at t=0) is zero. If required, change the scaling factor of given voltage scale. Mark voltage magnitudes carefully. Note: Assume OP-AMP output to be unsaturated.

Hint: $$v_0(t) = -\frac{1}{RC}\int v_1(t)dt$$

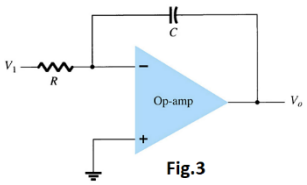
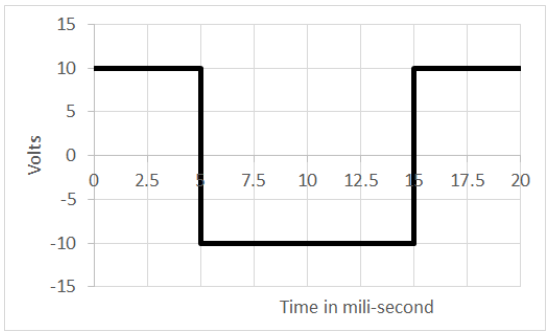
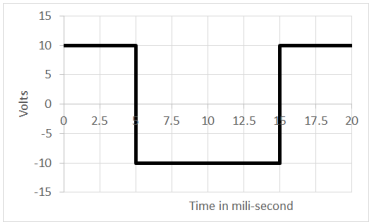


Fig.3





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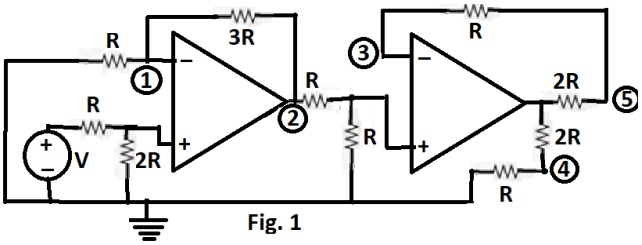
(Q1) Look carefully at the circuit in Fig.1. The OP-AMPs are ideal and the supply (V_{CC}) voltages are +15 V and -15V (while ground potential is at zero volt). An ideal dc voltage source (V) of 4.5 volts is connected as shown. Note the magnitudes of various resistances and the points (1 to 5) at which the steady state magnitudes of voltages are to be found. Write the magnitudes of voltages at different points in the space provided below. Write the answers sequentially, first, answer for point 1, then for point 2 and so on.



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Your answer: **(1)** ..... V **(2)**..... V

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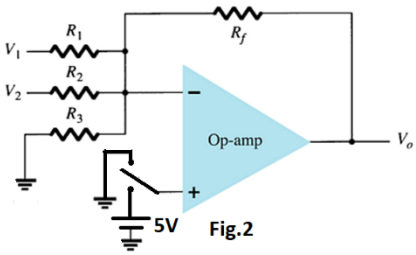
(Q2) The circuit of Fig.2 uses ideal OP-AMP with suitable supply voltages such that the OP-AMP's output does not saturate. The non-inverting pin of OP-AMP may be connected to either ground (i.e., zero potential) or to 5 V source as indicated in the figure. The output voltage 'V_0' is to be calculated for both cases. Take V_1 = 3V, V_2 = 6V, R_1 = 1 kΩ, R_2 = 1.5 kΩ, R_3 = 2 kΩ and R_f = 500 Ω.



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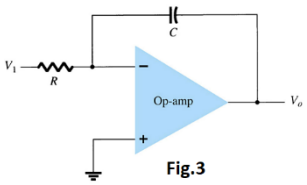

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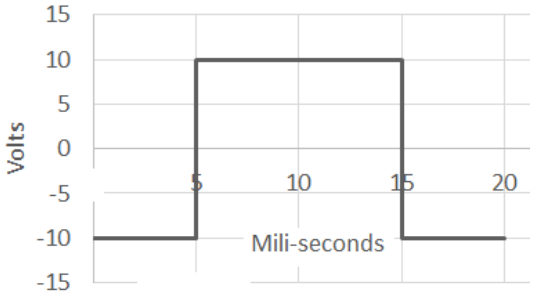

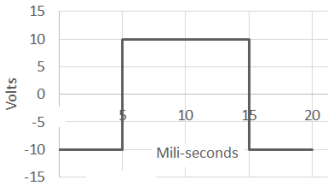

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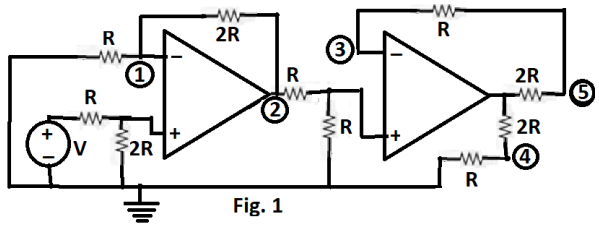

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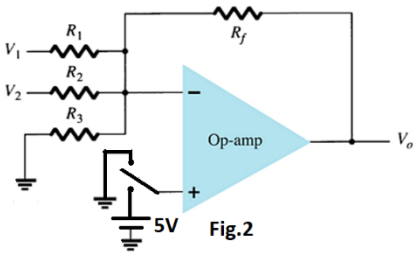

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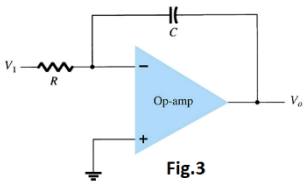

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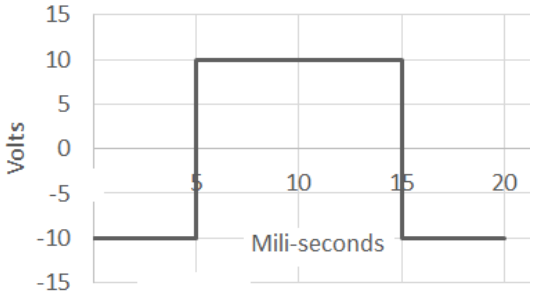

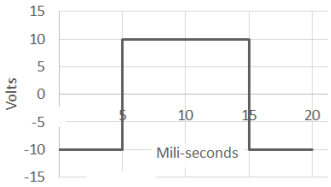

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