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King Fahd University of Petroleum and Minerals
Department of Electrical Engineering

Semester II 2006/2007 **Electronics II EE303** **Final Exam**

ATTEMPT ALL QUESTIONS
TIME ALLOWED THREE HOURS

Q1. Find an expression for the input impedance of the circuit shown in Fig. 1. **Assume all operational amplifiers are ideal and assume that the negative feedback is always dominant.** Discuss the possible applications of this circuit. I expect at least **TWO** applications.

Q2. Can the circuit in Fig. 2 oscillate? If your answer is YES, then find the frequency and condition of oscillation. If your answer is NO then obtain the transfer function of the circuit, identify it and discuss its possible application.

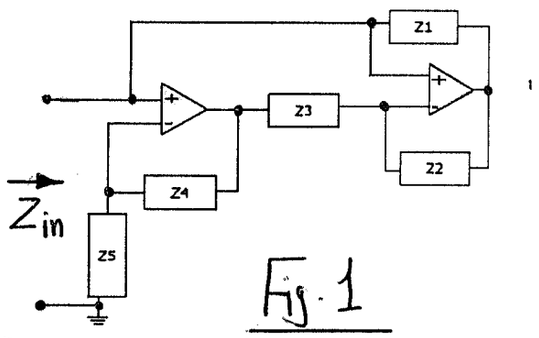
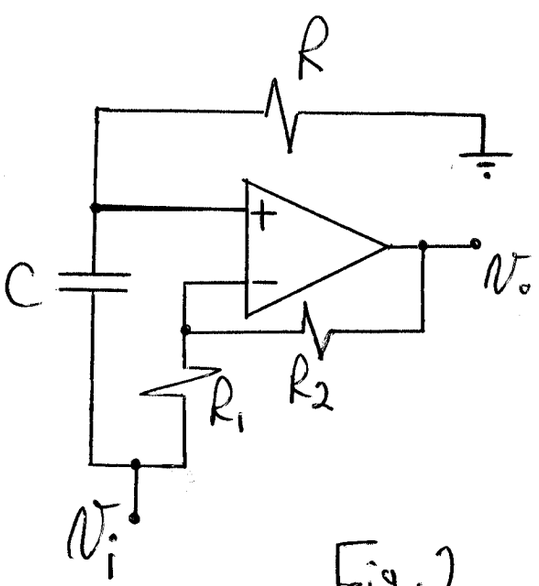


Fig. 1



$R_1 = R_2$

Fig. 2

Q3. We have an amplifier with a single-pole low-pass transfer function with a DC gain = 700 and a pole at 1 kHz. The amplifier has input resistance = 1 kOhm and output resistance = 100 Ohm. We want an amplifier with gain = 20 and with the smallest input and output resistances. Applying negative feedback is a possible solution. You are requested to answer the following questions:

1. What type of feedback configuration should we use?
2. What is the required ratio between the feedback quantity and the output quantity?
3. What will be the resulting input and output resistances?
4. What will be the resulting bandwidth?

Q4. Obtain the transfer function of the circuit shown in Fig. 3. Identify this circuit. Now do you think that in its present form this circuit can oscillate? If your answer is YES then what will be the frequency and the condition of oscillation? If your answer is NO then use the minimum number of active and passive components to convert it to an oscillator. Draw a complete circuit for your oscillator. Find the frequency and the condition of oscillation of your oscillator.

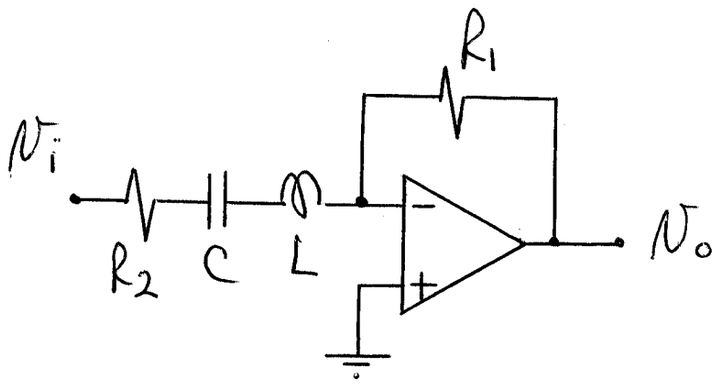
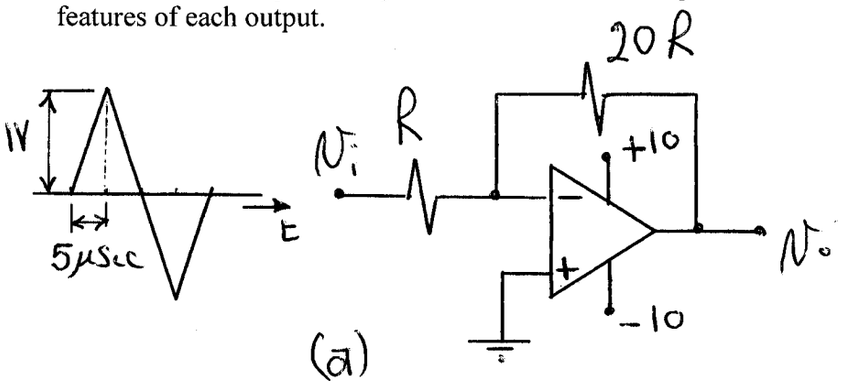


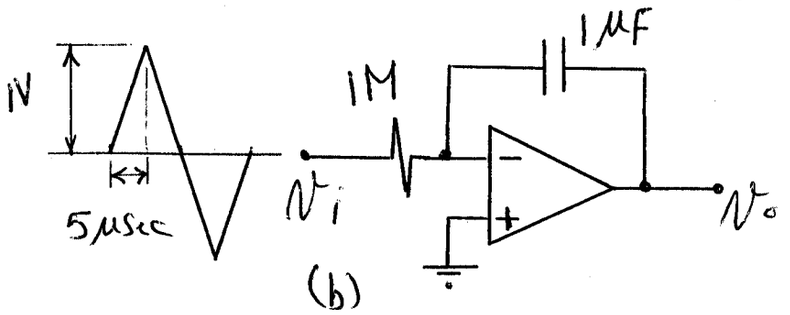
Fig. 3

Q5. Sketch the output voltage in each of the following circuits. Show the most important features of each output.

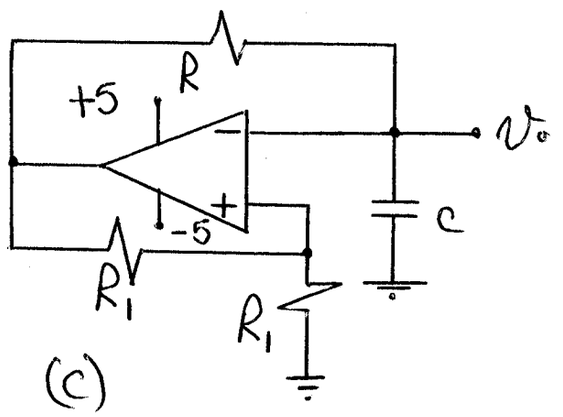


Slew Rate = 1V/μSec

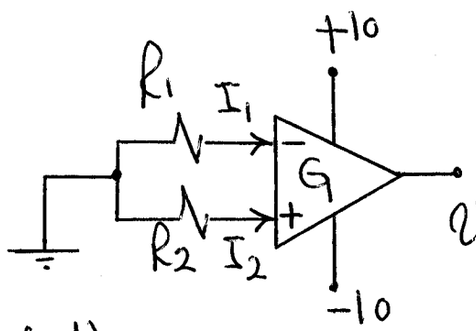
(a)



(b)



(c)



$R_1 = R_2 = 10\,K$

$I_1 = 1\,\mu A$

$I_2 = 2\,\mu A$

(d)

Fig. 4