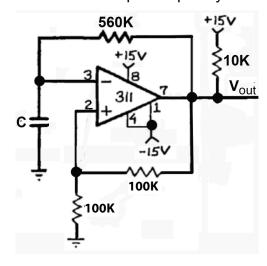
## Physics 120 Laboratory Practical Final Examination - 15 June 2017

Name	Student no.	Section	

The overarching goal of this exercise to construct a circuit that blinks an LED at a frequency near 8 Hz.

## Relaxation oscillator

(1; 2 pts) Select the value of C so that the output frequency is between 7 and 9 Hz.



(2; 2 pts) Build the circuit.

(3; 2 pts) Demonstrate the desired output with a stable, triggered pattern on the oscilloscope.

## FET current source

(4; 2 pts) Measure I<sub>DSS</sub> for the 2N5486 n-channel FET.

(Hint: Put an ammeter between the Drain supply voltage  $V_{DD}$  and the Drain lead of the FET. Mind the connections so that you do not blow the ammeter fuse!)

(5; 2 pts) Measure V<sub>GS</sub>(off) for the same 2N5486 n-channel FET.

(Hint: Use the variable and metered voltage of the "negative" power supply to vary  $V_{GS}$ )

- (6; 1 pt) Draw a circuit that incorporates the 2N5486 and functions as a current source, i.e., drives a fixed Drain current, denoted  $I_D$  with  $0 < I_D < I_{DSS}$ , through a load.
- (7; 2 pts) Calculate the value of the Source resistor for the above current source, denoted  $R_S$ , for a  $I_D$  = 5 ± 1 mA Drain current.
- (8; 3 pts) Build the current source, with  $I_D$  = 5 ± 1 mA and  $V_{DD}$  = +15 V, and add a LED as a load. Use a resistance substitution box, or individual resistors from the bins, to set R<sub>S</sub>.

## Merged circuit

(9; 2 pts) Connect the relaxation oscillator output to the Gate of the FET current source, noting the wiring change that is necessary to rhythmically drive the current source on and off.

(10; 2 pts) Demonstrate a blinking LED!

HAND IN THIS SHEET. Please make all design notes on the back side or include separate pages with your name and the page number.