

UNIVERSITY OF SWAZILAND

FACULTY OF SCIENCE

DEPARTMENT OF PHYSICS

MAIN EXAMINATION 2005

TITLE OF PAPER : ELECTRONICS (PAPER 2)

COURSE NUMBER : P310 (ii)

TIME ALLOWED: THREE HOURS

INSTRUCTIONS: The following will be required for the practical examination:-

Double-beam cathode-ray oscilloscope (CRO)

Function generator (FG)

15 V d.c. power supply

Digital multimeter (DMM)

Bread board

BC107 transistor

Resistors: 150 k Ω , 68 k Ω and 100 Ω

5 k Ω potentiometer

Capacitors: 220 μ F and 2 x 0.47 μ F

THIS PAPER HAS 4 PAGES, INCLUDING THIS PAGE AND SEMI-LOG GRAPH PAPER

DO NOT OPEN THE PAPER UNTIL PERMISSION HAS BEEN GIVEN BY THE INVIGILATOR

1. AIM

- (a) To study the voltage gain of a common-emitter amplifier as a function of frequency.
- (b) To study the phase change created by the amplifier over a wide range of frequencies.

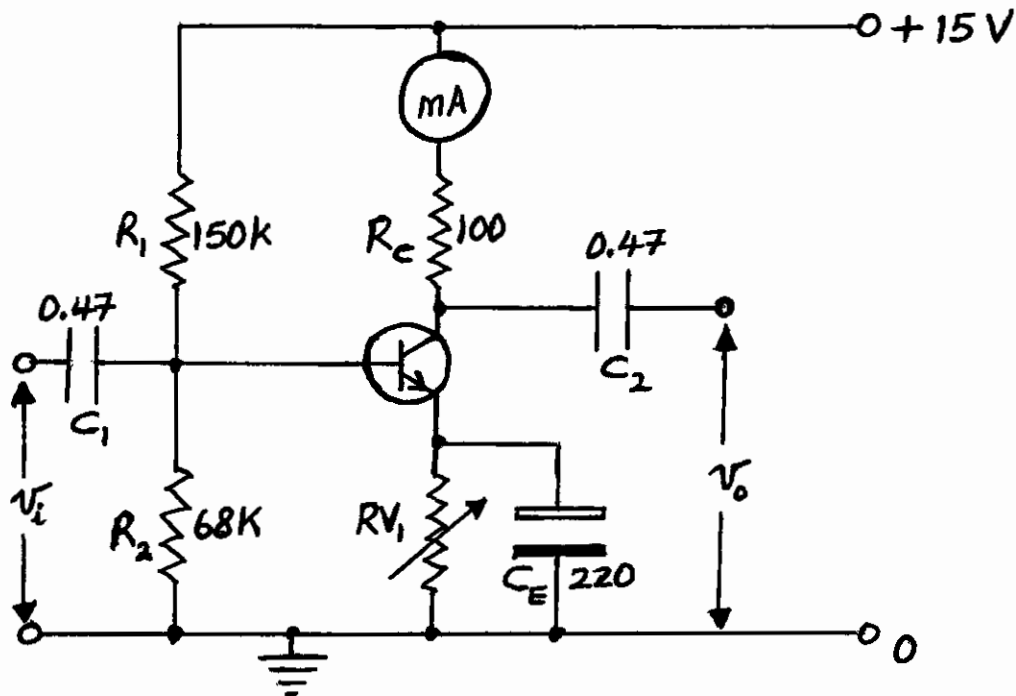


Fig. 1.

2. PROCEDURE

- (a) Connect the common-emitter amplifier to the breadboard as shown in Fig. 1.
- (b) Set V_{CC} to +15 V.
- (c) *With no input signal applied* to the amplifier, use the variable resistor RV_1 to set the collector current to 1 mA (d.c.).
- (d) Set the (FG) to the sine wave mode.
- (e) Feed a 1 kHz sinusoidal waveform from the function generator (FG) to the input of the amplifier.
- (f) Use Channel 1 of the double-beam oscilloscope to set this waveform to a peak value, $v_i = 10$ mV. Ensure that v_i is kept constant throughout the experiment.
- (g) Adjust the frequency of the FG and complete the table given on page 4. For each of the frequencies given, measure the corresponding peak output voltage, v_o using Channel 2. You should, at the same time, measure the phase difference, ϕ between v_o and v_i .

3. EVALUATION OF EXPERIMENT

- (a) (i) Determine the voltage gain, A_v for each frequency, f .
- (ii) Plot a graph of A_v against f . Use the semi-log graph paper provided.
- (b) (i) Determine the phase difference, ϕ between v_o and v_i for each frequency, f .
- (ii) Plot a graph of ϕ against f . Use the semi-log graph paper provided.

4. REPORT

Write a report consisting of the following sections:-

- ☞ Title
- ☞ Aim
- ☞ Results
- ☞ Analysis
- ☞ Conclusion

Note: You will be assessed on the following:

★	Presentation of report in general	10 marks
★	Results (measured data)	30 marks
★	Analysis of results	20 marks
★	Conclusion	20 marks
★	Handling and use of equipment and components, use of proper scale on oscilloscope, etc.	20 marks
	Total	100 marks

CANDIDATE'S EXAMINATION NUMBER:.....

Amplitude of input voltage, v_i _____ div at _____ V/div = _____ V .

Frequency, f (Hz)	Determination of voltage gain, A_v				Determination of phase difference, ϕ		
	Number of divisions	Volts per division	Output voltage, v_o	Voltage gain, A_v	Divisions per half cycle (corresponding to 180°)	Divisions corresponding to phase difference	Phase diff., ϕ
10							
30							
100							
300							
500							
1 000							
3 000							
5 000							
10 000							
20 000							

Note:

The completed table should be handed in together with your answer book.