



ELIZADE UNIVERSITY, ILARA-MOKIN, ONDO STATE
FACULTY OF ENGINEERING
DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

SEMESTER I EXAMINATION, 2016/2017 ACADEMIC SESSION

COURSE TITLE: ELECTRONIC CIRCUITS I

COURSE CODE: EEE 321

EXAMINATION DATE: 6TH APRIL, 2017

COURSE LECTURER: DR Afara /Dr. Alli-Oke

A rectangular box containing a handwritten signature in black ink.

HOD's SIGNATURE

TIME ALLOWED: 2 HOURS

INSTRUCTIONS:

1. ANSWER QUESTION 1 AND ANY OTHER TWO QUESTIONS (TOTAL OF 3 QUESTIONS)
2. SEVERE PENALTIES APPLY FOR MISCONDUCT, CHEATING, POSSESSION OF UNAUTHORIZED MATERIALS DURING EXAM.
3. YOU ARE NOT ALLOWED TO BORROW CALCULATORS AND ANY OTHER WRITING MATERIALS DURING THE EXAMINATION.

1)

- a) Transistors are three-terminal devices.
- Briefly explain *two* main functions of transistors in electronic design? (3 marks)
 - State the different packages in which transistors are manufactured. (3 marks) With respect to your answers, what does TO mean? (1 mark)
 - State *three* classifications of transistors you know. (3 marks)
- b) Bipolar Transistors (BJT) can be modelled as two diodes connected back to back.
- Briefly explain how this BJT transistor model works (3 marks)
 - Explain briefly why you can't make a transistor by using two physical diodes back to back. (1 mark)
 - With the aid of well-labelled diagrams, explain briefly three configurations of BJT transistors. (6 marks)
 - With the aid of well-labelled diagrams, explain briefly the operating modes of BJT transistors. (9 marks)

2) Consider the electronic circuit shown below in Fig 1.

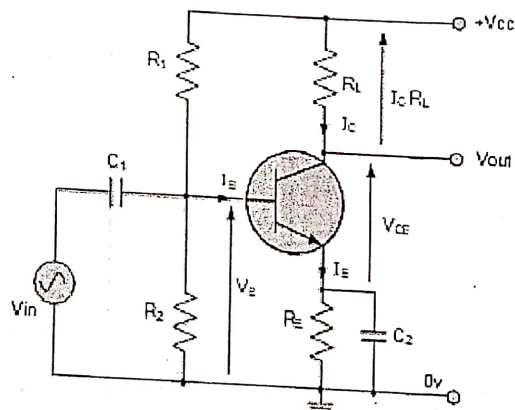


Fig. 1: Amplifying Circuit

- State the full name of circuit element C_1 . (2 marks) What is the function of C_1 ? Hint: $i = C_1 \frac{dV}{dt}$. (4 marks)
- State which BJT configuration is in Fig 1. Hint: include whether it is NPN or PNP. (2 marks)
- Given that β is 50, and V_{cc} is 12 V. Suppose that the Q-point is located at $V_{ce} = 0.5V_{cc}$. Assume that voltage drop across junctions is 0.7 V and that voltage across R_E is 1V. Also assume that current through R_2 is ten times the base current I_B . Design the values of R_1 , R_2 , R_E , and R_L such that I_c is 5mA. (10 marks)

3) Consider the electronic circuit shown below in Fig 2.

- The freewheel diode is also known as the flyback diode. What is the function of this diode? (4 marks)

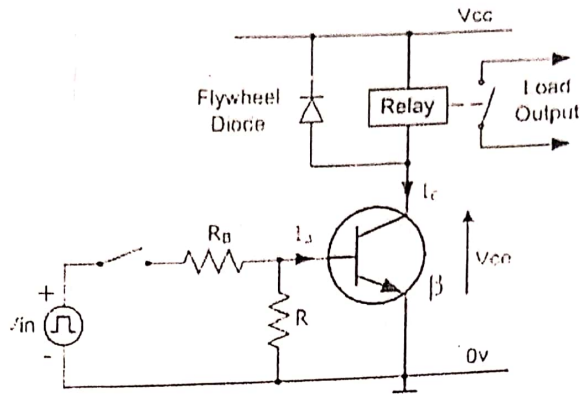


Fig. 2: Switching Circuit

- b) Given that β is 50, V_{be} is 0.7 V and V_{cc} is 12 V.
 - i) Determine the minimum base current required to "fully ON"/saturate the transistor for a load that requires 200mA to operate. *Hint: I_c is 200mA* (7 marks)
 - ii) Suppose that V_{in} has an ON-voltage of 5V, find the base resistor R_B required to "fully ON"/saturate the transistor for the same load conditions as in (i). (7 marks)

4) (5 marks)

- a) Draw a well-labelled symbolic diagram of an op-amp. (4 marks)
- b) Explain the terms - "input offset voltage" and "slew rate" (4 marks)
- c) An op-amp operating with negative feedback produces an output of 2V when supplied with an input signal of 200mV
 - i) Determine the decibel-value of the closed-loop voltage gain. (3 marks)
 - ii) If the input impedance is $2.5M\Omega$, compute the input current. (2 marks)

d) A wideband op-amp has a slew rate of $15V/\mu s$. If the op-amp is used in a circuit with voltage gain of 20 and a perfect step signal of 100mV is applied to its input, compute the time taken for the output to change level. (4 marks)