

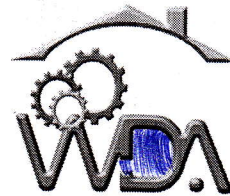
ELC – Applied Electronics

T005

Wednesday, 28/11/2018

08:30 – 11:30 AM

WORKFORCE DEVELOPMENT AUTHORITY



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**ADVANCED LEVEL NATIONAL EXAMINATIONS, 2018,
TECHNICAL AND PROFESSIONAL STUDIES**

EXAM TITLE: APPLIED ELECTRONICS

OPTION: Electricity (ELC)

DURATION: 3 hours

INSTRUCTIONS:

The paper is composed of **the following sections:**

Section I: Fourteen (14) compulsory questions. 55 marks

Section II: Attempt any three (3) out of five questions. 30 marks

Section III: Attempt any one (1) out of three questions. 15 marks

Note:

Every candidate is required to carefully comply with the above instructions. Penalty measures will be applied on their strict consideration.

You're allowed to use a calculator.

01. Define the following terms:

- a. Capacitor Dielectric
- b. Optoisolator
- c. Dc power supply.

(3 marks)

02. How is a resistor classified?

(2 marks)

03. Make a comparison between potentiometer and a rheostat.

(4 marks)

04. Explain how zener diode maintains constant voltage across the load.

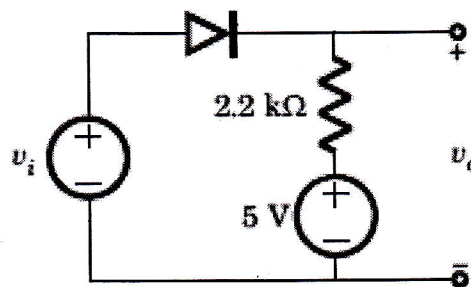
(4 marks)

05. In which operating regions can a Bipolar Transistor behave like a switch?

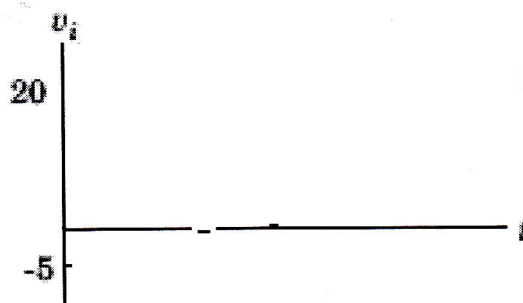
(4 marks)

06. For the given circuit and input waveform below, you are asked to determine the output waveform.

(3 marks)



Circuit



Input waveform

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 Nyine ni bintu bya
 Aficator nyine arko
 nabuze 12 mille
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07. List at least five (5) rectifier problems that may occur.

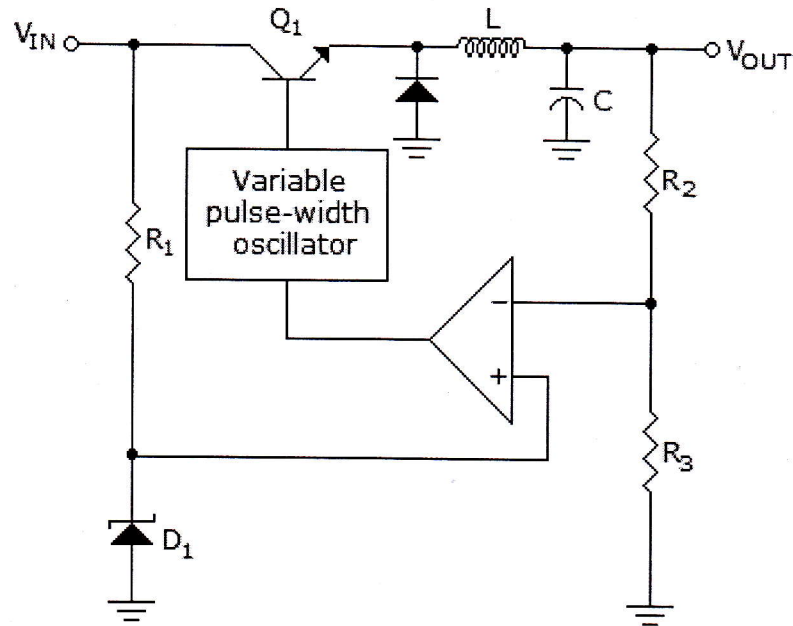
(5 marks)

08. What is the purpose of an additional RC filter section in a power supply circuit?

(3 marks)

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09. What is the name of the circuit given below and also state the purpose of capacitor and inductor in that circuit. **(4 marks)**

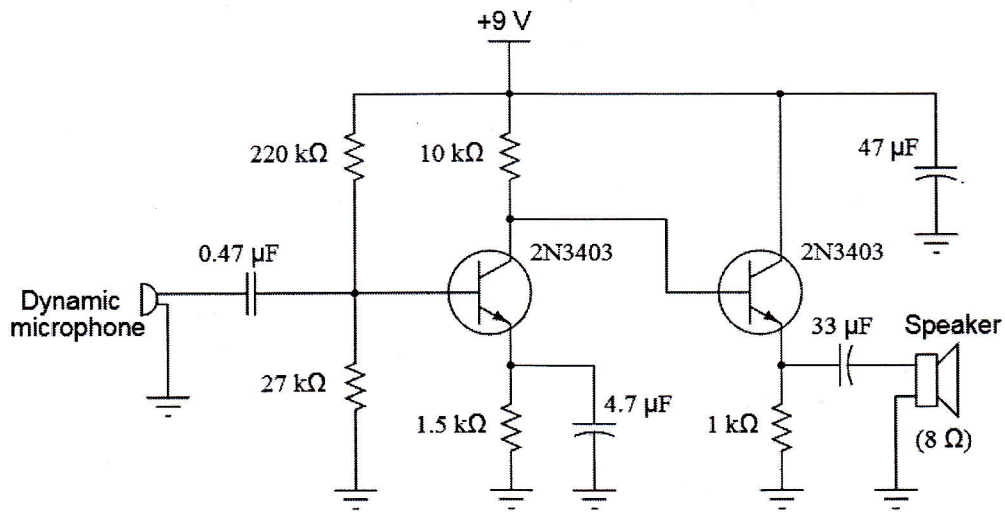


10. What is the purpose of using Radio frequency chokes (RFC) in Colpitts oscillator circuit instead of using a resistor? **(4 marks)**
11. List at least five (5) characteristic of Ideal Operational amplifier (OMPAMP). **(5 marks)**
12. Compute the oscillator frequency of RC phase shift oscillator having a resistor of $10\text{K}\Omega$ with the capacitor of 7nF . **(5 marks)**
13. How are single and double sided boards fabricated? **(5 marks)**
14. Give the difference between Active and Passive Sensors. **(4 marks)**

Voltage - Voltage ; Voltage in , Voltage out
 Current - Current ; Current in , Current out
 Transistor: Voltage in , Current out.
 Transformer: Voltage out , Current in

Section II. Choose and answer any three (3) questions. (30 marks)

15. In the simple, two-stage audio amplifier circuit as shown below,

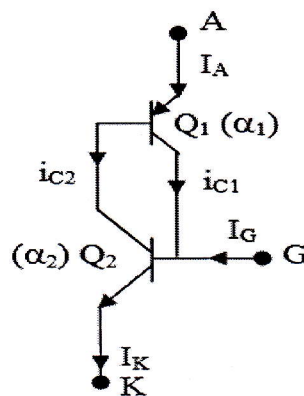


Identify the role of the following components in this audio amplifier circuit:

1. The $0.47\mu\text{F}$ capacitor connected to the microphone
2. The $220\text{ k}\Omega$ and $27\text{ k}\Omega$ resistor pair
3. The $4.7\mu\text{F}$ electrolytic capacitor connected across the $1.5\text{ k}\Omega$ resistor
4. The $33\mu\text{F}$ electrolytic capacitor connected to the speaker
5. The $47\mu\text{F}$ electrolytic capacitor connected to the power supply rail

(10 marks)

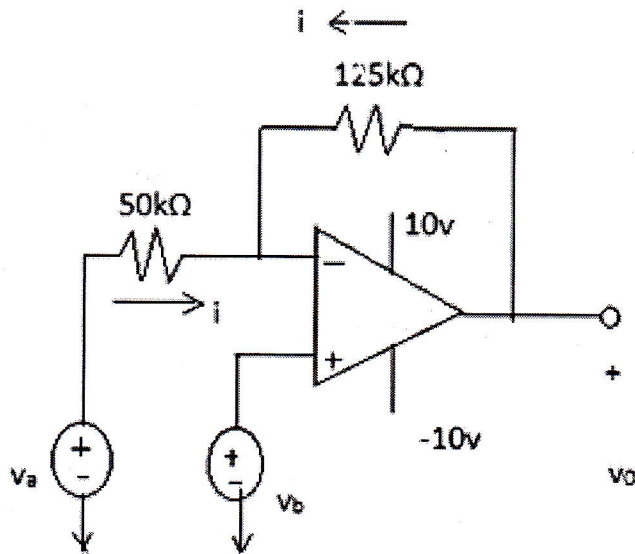
16. For the thyristor circuit below, explain if you expect a thyristor to turn ON if a positive gate pulse is applied under reverse bias condition (or cathode positive with respect to anode).



(10 marks)

thyristor circuit

17. The circuit below shows an ideal op-Amp. You are asked to calculate v_o when $v_a=1v$ and $v_b=0v$. Given Op-amp is ideal. Calculate v_o if $v_a=1v$ and $v_b=0v$.



(10 marks)

18. A 50Ω load resistance is connected across a half wave rectifier. The input supply voltage is 230V (rms) at 50 Hz. Determine the DC output (average) voltage, peak-to-peak ripple in the output voltage (V_{p-p}) and the output ripple frequency (f_r) and give comments on percentage ripple.

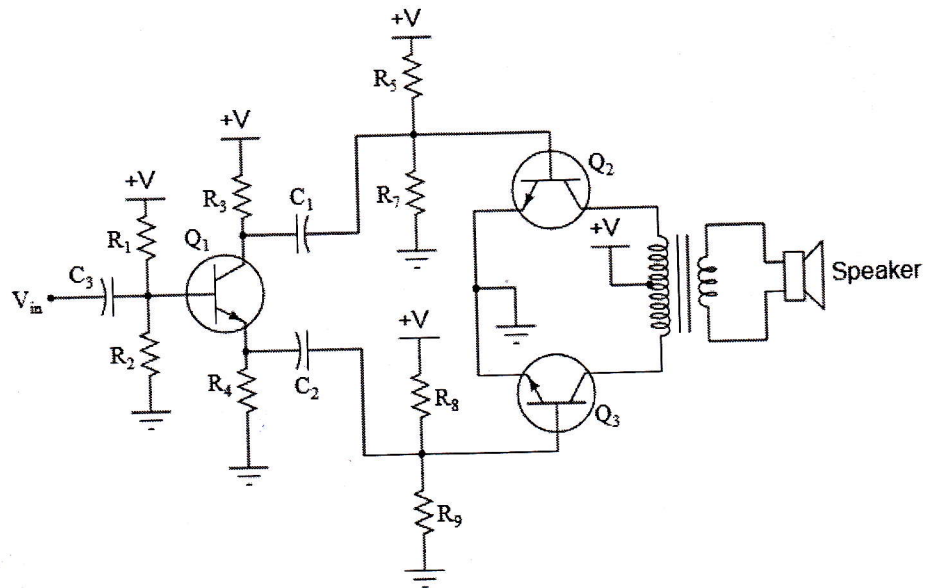
(10 marks)

19. Make a short note on the following terms “under-damped”, “over-damped” and “critically-damped”. Give examples of when two of these properties can be exploited in real-world applications.

(10 marks)

$$\left(\frac{N}{P+I} \right) \times 100\%$$

20. The circuit below presents a class-B audio power amplifier circuit that has a problem as follows: Its output is much distorted, resembling half of a sine wave when tested with an input signal from a function generator:



The output signal measured using oscilloscope at speaker terminals is as follows:



You are asked to list at least three possible faults in this system, based on the output signal shown by the oscilloscope. And also you are required to determine which components, if any, are known to be good based on the same signal.

(15 marks)

21. Suppose that you are given a Power Amplifiers to repair. Explain steps you have to go through while you are repairing.

(15 marks)

22. Explain the Thyristor Voltage ratings.

(15 marks)