RAMAIAH UNIVERSITY OF APPLIED SCIENCES

Faculty of Engineering and Technology			
Department	**Electronic and Communication Engineering**	Programme	**B. Tech. (All branches)**
Semester / Batch	**2nd/2017**		
Course Code	**ESC102A**	Course Title	**Elements of Electronic Engineering**
Course Teacher	Dr. Christy Bobby / Mr. Ambresh Biradar / Mrs. Soumya Sunny / Mrs. Deepthi / Mr. Bharath Kumara		

Assignment No. 1

Register No.		Name of Student	

Sections		Marking Scheme	Max Marks	First Examiner Marks	Second Examiner Marks
Part-A	A1.1	Construction and properties of GaAs, Si and Ge diodes	3		
	A1.2	Discussion on the advantages and limitations of GaAs, Si and Ge diodes in high speed electronic circuits	3		
	A1.3	Conclusion with justification of stance	4		
		Part-A Max Marks	**10**		
Part B 1	**Clipper circuit**				
	B1.1	Expression of the output voltage	2		
	B1.2	Calculation and sketch of output voltage	3		
	B1.3	Simulation of the circuit	3		
	B1.4	Transfer characteristics	2		
		Part B.1 Max Marks	**10**		
Part B 2	**Diode circuit**				
	B2.1	Design of the circuit	4		
	B2.2	Verification of design using simulator	3		
	B2.3	Specifications of the components used	3		

		Part B.2 Max Marks	**10**		
Part B 3	**Clamper circuit**				
	B3.1	Design of the circuit	3		
	B3.2	Verification of design using simulator	3		
	B3.3	Specifications of Diode, Capacitor and Input signal	2		
	B3.4	Effect of R and C on output	2		
		Part B.3 Max Marks	10		
Part B 4	**BJT Circuit**				
	B4.1	Identification of the configuration	1		
	B4.2	Calculation of circuit currents	3		
	B4.3	Effect of V_{CB} on I_E	3		
	B4.4	Effect of V_{CE} on I_B	3		
		Part B.4 Max Marks	**10**		
		Total Assignment Marks	50		

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Subject Marks Tabulation				
Component- CET B Assignment	**First Examiner**	**Remarks**	**Second Examiner**	**Remarks**
A				
B.1				
B.2				
B.3				
B.4				
Marks (Max 50)				
Marks (out of 25)				
Signature of First Examiner				Signature of Moderator

Please note:

1. Documental evidence for all the components/parts of the assessment such as the reports, photographs, laboratory exam / tool tests are required to be attached to the assignment report in a proper order.
2. The First Examiner is required to mark the comments in RED ink and the Second Examiner's comments should be in GREEN ink.
3. The marks for all the questions of the assignment have to be written only in the **Component – CET B: Assignment** table.
4. If the variation between the marks awarded by the first examiner and the second examiner lies within +/- 3 marks, then the marks allotted by the first examiner is considered to be final. If the variation is more than +/- 3 marks then both the examiners should resolve the issue in consultation with the Chairman BoE.

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Assignment – 1

Term - 1

Instructions to students:

1. The assignment consists of 5 questions: Part A – 1 Question, Part B- 4 Questions.
2. Maximum marks is 50.
3. The assignment has to be neatly word processed as per the prescribed format.
4. The maximum number of pages should be restricted to **20**.
5. Restrict your report for Part-A to 3 pages only.
6. Restrict your report for Part-B to a maximum of 17 pages.
7. The printed assignment must be submitted to the subject leader.
8. **Submission Date: 12th March 2018**
9. **Submission after the due date is not permitted.**
10. **IMPORTANT**: It is essential that all the sources used in preparation of the assignment must be suitably referenced in the text.
11. Marks will be awarded only to the sections and subsections clearly indicated as per the problem statement/exercise/question

Preamble

This course deals with the concept of basic electronics and their application. The subject provides students an understanding of the essential principles and terminology that are used in basic electronics. Students are taught semiconductor devices such as transistors, amplifiers, displays and power supplies. Students will be trained on the design, simulation and development of electronic devices and circuits using standard EDA tools.

PART A **(10 Marks)**

Preamble

Semiconductor physics arises from the unique properties of silicon (Si) and germanium (Ge). The electrical properties of Si and Ge change dramatically when substituted atoms (dopants) are added. Semiconductors are used in many electronic applications. Gallium arsenide (GaAs) is another important semiconductor compound of gallium and arsenic. GaAs also a third - fifth direct bandgap semiconductor. It is used in microwave frequency integrated circuits, monolithic microwave integrated circuits, infrared light-emitting diodes, laser diodes and solar cells.

Debate on the statement: **"GaAs diodes are preferred over Si/Ge diodes in high speed electronic circuits"**

The debate should encompass the following:

A1.1 Construction and properties of GaAs, Si and Ge diodes

A1.2 Discussion on the advantages and limitations of GaAs, Si and Ge diodes in high speed electronic circuits

A1.3 Justification of stance with conclusion.

PART B **(40 Marks)**

B.1 **(10 Marks)**

Diode clippers have wider application in television receiver for separating synchronizing signals from composite picture signals and also in television transmitters at the time of processing the picture signals. They are also employed for different wave generation such as trapezoidal, square or rectangular waves. Series clippers are employed as noise limiters in FM transmitters by clipping excessive noise peaks above a specified level. Consider a clipper circuit shown in Figure 1 and carry out the following:

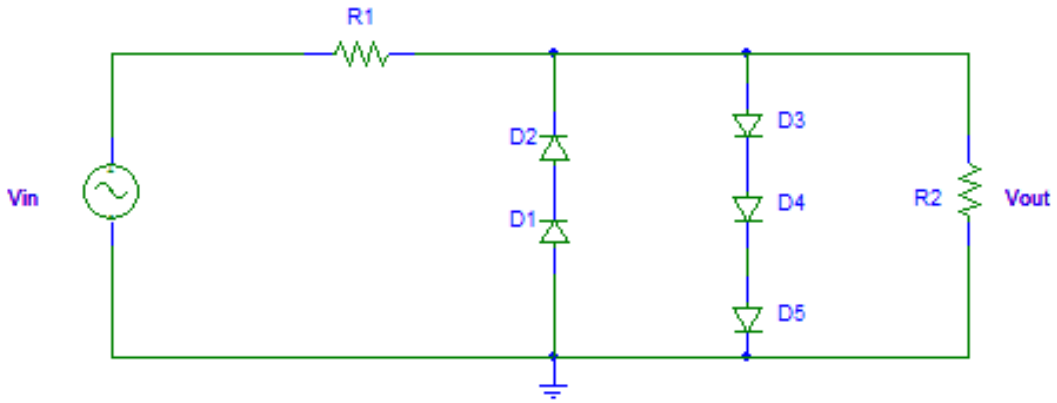

Figure 1

B1.1 Obtain an expression for the output voltage (V_{out}), if input voltage $V_{in} = V_m Sin(\omega t)$ V. Assign appropriate values for V_m and ω. Assume R1 and R2 values in the range of 100 Ω to 100 kΩ.

B1.2 Calculate the value of V_{out}. Sketch the four cycles of output waveforms with calculated V_{out} values for the given input, if diodes D_1, D_2, D_3, D_4 and D_5 used are silicon diodes.

B1.3 Simulate the given circuit for the given input using a suitable standard software tool and obtain the input and output waveforms.

B1.4 Obtain the transfer characteristics of the circuit.

B.2 **(10 Marks)**

An audio power amplifier amplifies low-power electronic audio signals such as the signal from radio receiver or electric guitar pickup to a level that is strong enough for driving loudspeakers or headphones. An audio power amplifier typically requires a 12 V DC to operate.

B2.1 Design a suitable circuit to convert AC input to an output suitable to operate audio power amplifier by using diode and Zener diode without using a step down transformer.

B2.2 Verify the designed circuit using a standard software tool.

B2.3 Discuss the specifications of components of the designed circuit.

B.3 **(10 Marks)**

Television receiver has clamp circuits for equalising video levels which maintain a specific voltage level to restore the original DC reference signal (corresponding to the brightness of the picture) to the video signal.

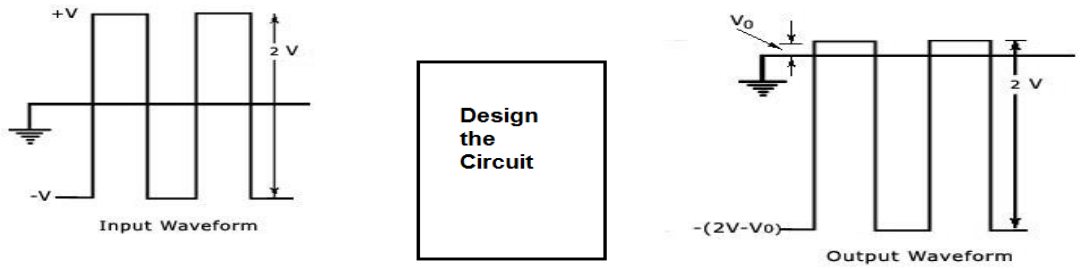

Figure 2

B3.1. Design a circuit using diode, resistor and capacitor to obtain shifted output as shown in Figure 2. The square wave input having peak-to-peak voltage of 40 V and frequency (F) are shown in Figure 2.

Note: Assume frequency F of operation in the range 100 Hz – 100 kHz.

B3.2. Verify the designed circuit using a suitable simulator and explain the results.

B3.3. Discuss the specifications of the components used for the design.

B3.4. Comment on the effect of capacitor and resister values on the output waveform.

B.4 **(10 Marks)**

Bipolar Junction Transistor (BJT) is a 3 terminal semiconductor device. There are three basic circuit configurations that can be used with BJTs. It is necessary to adopt the transistor circuit configuration that will provide the required attributes while designing a transistor circuit. Figure 3 shows a BJT based circuit used for impedance matching application.

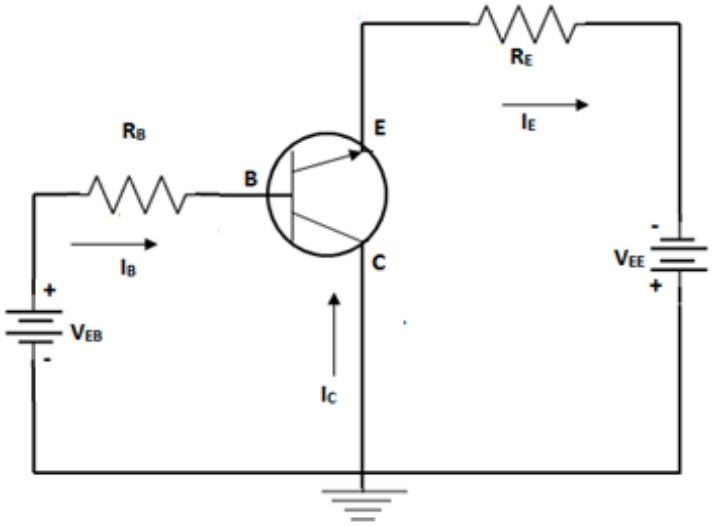

Figure 3 Transistor circuit

B4.1. Identify the configuration of the BJT.

B4.2. Calculate the circuit currents I_B, I_C and I_E. Consider V_{CB} = 1 V and V_{EE} = 7.5 V.

Note: Assume value of resistors R_B, R_E in range 10 kΩ to 10 MΩ.

B4.3. Comment on the effect of voltage V_{CB} on the current I_E.

B4.4. Comment on the effect of voltage V_{EE} on the current I_B.