Research article Available online www.ijsrr.org ISSN: 2279–0543

International Journal of Scientific Research and Reviews

Designing of Monostable Multivibrator Circuit Using Conducting Properties of Synthetic Plasma

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ABSTRACT:

Since last decade, biotechnology domain has offered many open research issues. This led to significant developments all over the world. High quantum of work has been proposed for solid state electronic circuits. Electronic circuit realization using conductivity of liquid medium is the key issue now a day. The research has been focused to get the stable result from the aforesaid circuit using different feasible apporoaches. One of the feasible approache has been aaplied here to demonstrate the basic monostable multivibrator circuit. The result shows strong possiblility to develop liquid electronic circuit. Here, the author has systamatically replace each solid component using liquid medium and finally designed liquid circuit. The syntheic plasma has been formed in the laboratories to be used as conducting liquid. Power supply and analog input signal has been applied to the circuit by conventional power supply generator and function generator respectively. The response from the circuit has been observed in cathore ray ossilloscope. Similar kind of circuit could be investigated using human implantable material.The presented biological electroic circuit has a potential to work as an implantable circuit for humanbody. These kind of circuits are effectvely utilised for cyborg implants/engineering, man-machine interface, human disease detection and healing, artificial brain evolution in biotechnology domain.

KEY WORDS: Liquid medium, synthetic plasma

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INTRODUCTION:

S. P. Kosta has significantly contributed in realising the electronic circuit using liquid medium. S. P. Kosta and his team investigated biological memristor using conductinng medium.At the end of their research, they have presented the effects of variables like:[i] distance(d) between device forming probes [ii] applied voltages [iii] probe's pressure (p)[iv] probe polarization, on the input/ output characteristics as well as current gain factor β of the transistor can be formed[1]. Even first biological memristor circuit using human tissue- skin has been developed by his team. The authors claimed that biomedical human body parts like blood, skin or any tissue based electronic circuit has very novel application create human machine interface and cyborg implants[2]. S. P. Kostaet al did analysis on the composition of human blood. Blood is made up from different particles like white cells, red cells, positive ions and negative ions. By proper understanding of their composition and characteristics, they could be effectively utilised in developing low frequency electronic components and circuits. Kosta and his team used blood variables like temperature, forming probe distance, flow rate and different density blood groups as a transistor parameters [3]. Using the well-known concept of human body conductivity, field effect transistor can be developed using three points (probes) of human hand palm (first two) fingers. Here, the authors have used silver coated copper rings to provide sufficient and stable pressure for all three probes on the palm finger in order to do analysis on a common configuration[4,5].Marc Simon Wegmueller has also tried to project human body as conducting medium for certain circuits and networking protocol. The human body is neutral in nature but every human being live cells are surrounded by a tissue made up of a fatty acid bilayer with proteins implanted in it [6,7].Yogesh P. Patil and his team tried to find out the effect of nano particles in to the human body because they are always present in any humans. For the same research the authors realized that metal can be implanted into the human body and this technique is very useful to understand the chemistry of nano particles[8].Zedong Nie and his team claimed that human body could be the promising and effective path for the short range communication. The authors have talked about the sensors which could be placed on the human body surface. The said sensors are charged using the body energy. The authors have developed S-TDMA protocol for efficiency, traffic control and delay calculation[9].A novel human implantable neural recording system could be developed which can extract the power from live human cell and supply the same power for the biomedical neural recording system [10].Marc Simon Wegmueller and his team have done the experiment on sensor network inside the human body. The authors have put the sensors pills in different locations of the human body and tried to make them interactive in order to form a low frequency sensor network. Authors also reported that below 10 kHz frequency, there was less

interference between current and body cells so those frequency range should be avoided[11]. Marc Simon Wegmueller and his team claimed that four transistors and one receiver set is feasible to implant into the human body at certain frequency range. The authors have successfully demonstrated a wireless communication system on muscle tissue which is capable for data transmission on multiple channels. The authors have used anechoic chamber for noise free atmosphere. In conclusion, they stated that human implantable system is feasible for long and healthy life of a human being with proper medical care[12, 13]. Derek P. Lindsey et al founded the new way of signal transmission in the human body between two points of implantable device. The authors have effectively used the ionic property of human body fluids. Several parameters like distance between two electrodes, the frequency of the transmission and current which had been injected have been carefully studied[14]. Killol Pandya and S P Kosta have tried to demonstrate liquid electronic transistor amplifier circuit using synthetic plasma[15].

EXPERIMENTAL SECTION:

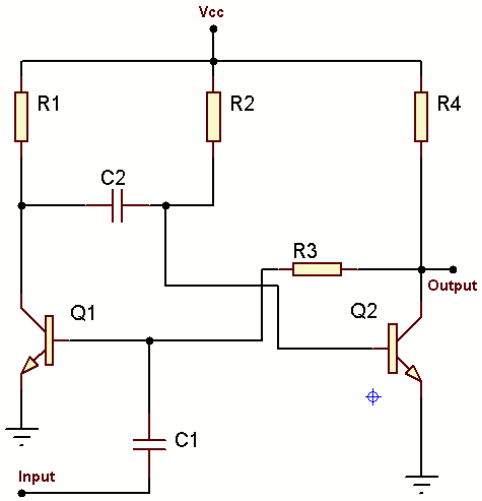

Fig. 1. Ideal monostablemultivibrator circuit

Fig. 1 depicts the basic ideal mono stable multi vibrator circuit. A multi vibrator is used to design two stage systems such as flip-flops, oscillators and timers. Mono stable multi vibrator can also be used to get one of the stage stable like timer. In monostanle multi vibrator circuit, one of the transistor (Q1) ON and the other(Q2) is OFF . Consequently, Vc1 is low and Vc_2 is high.

Fig. 2 shows lay out of liquid based biological mono stable multi vibrator circuit. Here, each beaker represents component of the circuit. Two electrodes are carefully inserted in the beaker filled with synthetic plasma (liquid conducting medium) with appropriate distance. The author has soldered thin, flat copper plate with the copper wire and inserted it in the plasma filled beaker. The aforesaid kind of electrodes form collector, emitter and base of the biological transistor. To maintain

glass beakers for a long time and also for their proper instrumentation, wooden stand has been used. Power supply instrument has been used to give necessary Vcc voltage. Input signal has been provided using trigger generator. The circuit response has been recorded by cathode ray tube. Conducting synthetic plasma-liquid has been developed in laboratories. To get the stable response from the liquid circuit, similar experiments have been performed three times with different density synthetic plasma. They are 1 litre, 1.3 litre and 1.5 litre.

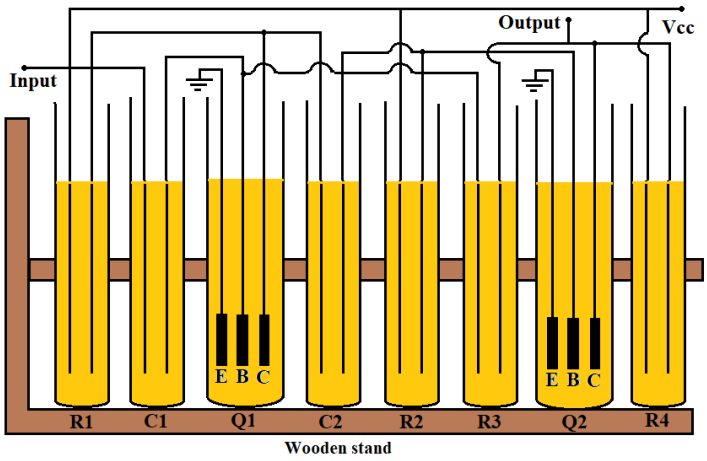

Fig. 2. Lay out of liquid based biological mono stable multi vibrator circuit

Liquid integrated circuit:

The research has been continued by the author in the form of developing liquid integrated circuit. The basic concept of integrated circuit is all utility pins and other connections are embedded on single silicon wafer. Utilising the similar concept, the author has inserted all component probes in a big beaker filled with aforesaid conducting medium. Fig. 3 shows the layout of mono stable multi vibrator integrated circuit. Proper mechanical instrumentation is required to keep the constant distance between the two probes. To achieve this, wooden block having holes at specific distances made in mechanical workshop. The copper wires are passed through the wholes and wooden block is placed on the top of the beaker. The holes created through the wooden block, helps the circuit to keep appropriate distance between the copper wires. Here, also different density liquids are used to get stability of the circuit. All experiments have been performed at room temperature.

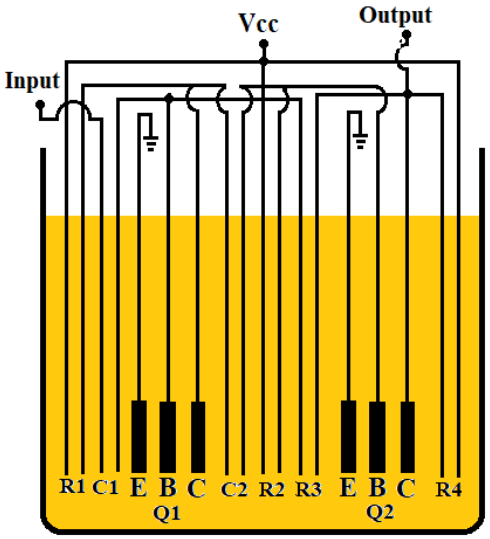

Fig. 3. Mono stable multi vibrator integrated circuit layout.

RESULT AND DISCUSSION:

Fig. 4 depicts the output of liquid based mono stable multi vibrator circuit. Of course the output is pulse waveform in nature. Here, the author have carried out both the outputs from the two transistors. Yellow line shows the Vc_1 output from Q1 transistor. Similarly, blue line shows Vc_2 output from Q2 transistor. Output could be generated from the circuit by applying trigger pulse to the circuit as input. Similar output has also been recorded from aforesaid IC.

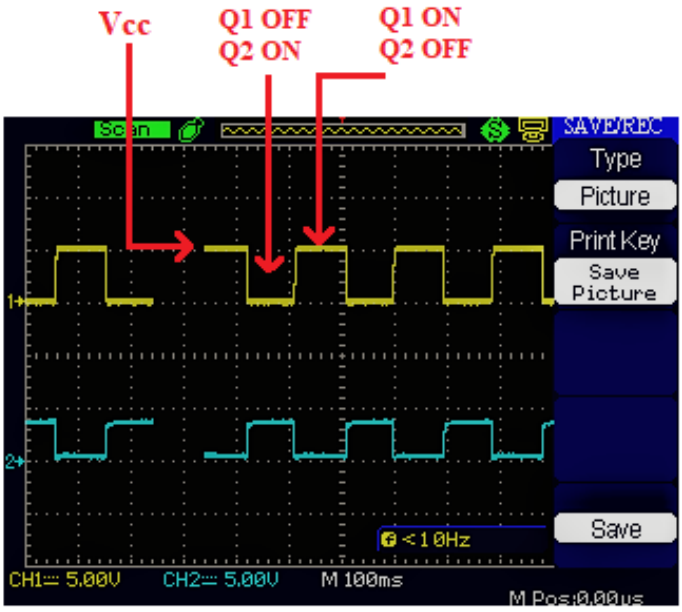

Fig. 4. Output of mono stable multi vibrator circuit

CONCLUSION:

Biological mono stable multi vibrator electronic circuit has been successfully investigated and analysed in this paper. The result depicts the feasibility of similar kind of circuits using conducting property of liquid medium. If the research is extended to developed human body friendly circuit using implantable material, it would be the beginning of novel research in the field of biological and biomedical science.

ACKNOWLEDGEMENT:

Author is extremely thankful to Charotar University of Science and Technology (CHARUSAT) for direct and indirect support.

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