EXPERIMENT – 1

OBJECT :

Use of Astable Multivibrator and Calculate the frequency by changing the base resistance/capacitance.

APPARATUS REQUIRED :

1. Multivibrator Set – Up. – 1
2. A measuring Oscilloscope or an ordinary Oscilloscope – 1.
3. Connecting leads – 5.
4. Co-axial cable with BNC & crocodail clip – 2.

THEORY:

Multivibrator is an Oscillator which produces voltage pulses and extended voltage waveforms, usually occurring periodically. It uses two active devices with positive feedback in such a way that the two devices tend towards opposite states i.e. one ON and other OFF. In principle, it is a two stage R.C. Coupled Amplifier. The output voltage of one stage is feedback to another stage which sustains the oscillations. R.C. constant of the circuit determines the frequency of the multivibrator.

Multivibrators are switching circuit, which form basic blocks of all counting and shaping circuits used in nuclear device. Moreover, they are basis of all digital logicals devices such as high speed computers. Some of the other applications are as follows:

(i) Generation of pulses occurring periodically
(ii) Generation of extended waveforms occurring periodically.
(iii) Synchronized generation of pulses and extended waveforms.
(iv) Frequency multiplication
(v) Introduction of time delay.

Multivibrators may be classified in the following three categories:

(A) ASTABLE OR FREE RUNNING MULTIVIBRATOR :

This generates voltages pulses, and voltage extended waveforms occurring at regular intervals, independently i.e. without any driving or external synchronizing voltage pulse.

CIRCUIT DIAGRAM :

The basic circuit diagram of Free Running Multivibrator is shown in Fig. 1. The circuit consists of two p-n-p switching transistors which are forward biased. However, if one transistor say T_1 begins to conduct, the collector voltage drops and this drop appears on the base of T_2 due to C_1. Thus T_2 is being turned OFF and regeneration through C_2 drives T_1 to ON, while T_2 is completely turned OFF. At this point C_1 has been charged through

R_3 and T_2 to almost = 9 Volt, presents a voltage of – 9 Volt at base of T_2. Its discharge path is through the conducting transistor T_1 until T_2 begins to conduct again. The regeneration now occurs through C_2 and the circuit instantaneously reverse its mode of operation. It remain in ON position until the capacitor C_2 discharges through T_2.

If the time constant R_1 C_1 and R_2 C_2 are equal, -symmetric waves will be obtained. The frequency of free running multivibrator can be obtained from the following formula.

$$F = \frac{1}{0.69\,(R_1C_1 + R_2C_2)}$$

PROCEDURE :

1. Connect the Set – Up to A.C. Mains, set – up power switch is off.
2. Connect – 9 Volt power supply to the terminals marked on the circuit.
3. Connect the oscilloscope between the terminals output I & ground switch ON and waveform.
4. Connect the oscilloscope between the terminals output II and ground. Observe the waveform.
5. Change the values of capacitance's C_1 and C_2 through the Rotary switch S and repeat steps 3 and 4.

OBSERVATIONS :

Draw the waveforms at Output I and Output II different values of C_1 and C_2. Read the frequency of oscillation at output I on a measuring oscilloscope or in case of an ordinary oscilloscope, count the number of pulses and now apply the pulse signal from the pulse generator to the input of oscilloscope and try to obtain the same number of pulses on the oscilloscope. The reading of the pulse generator will be the frequency of the free running multivibrator.

CALCULATIONS :

Obtain the theoretical frequency of multivibrator form Equation 1 for different values of C_1 and C_2.

RESULTS :

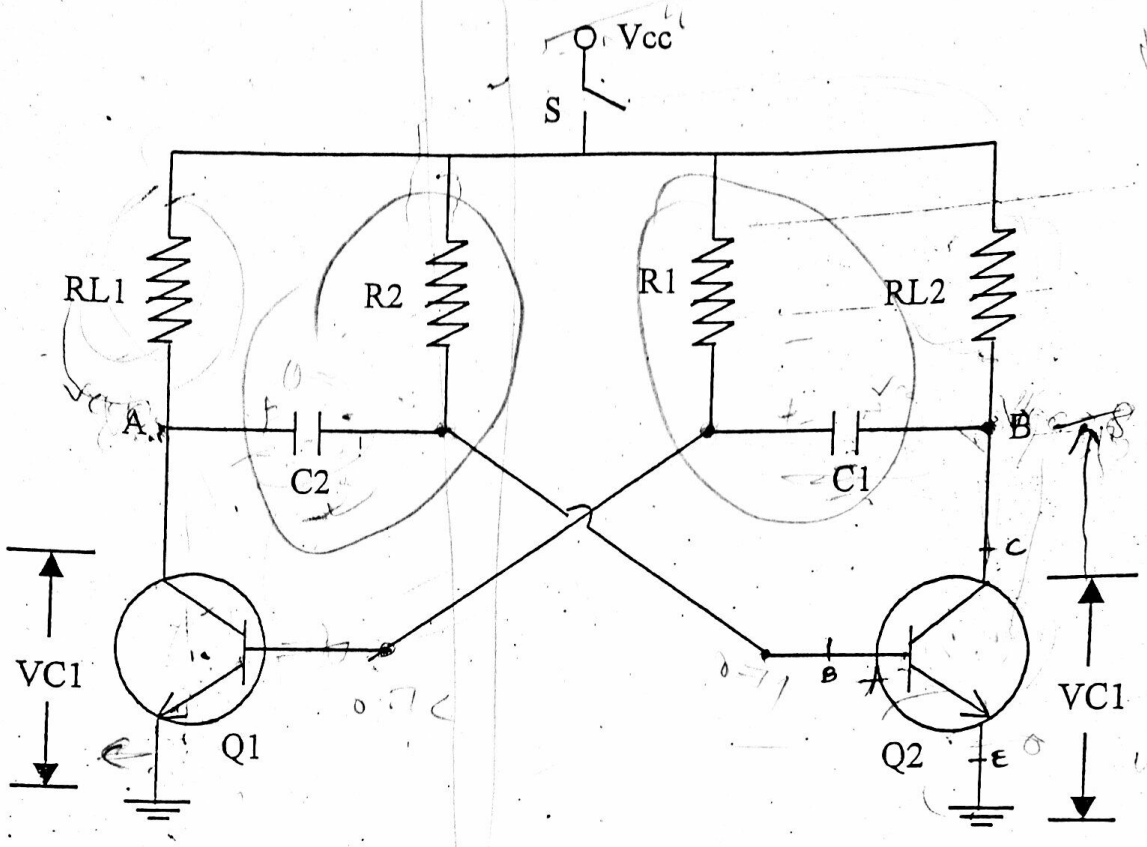
SET NO. 1 :

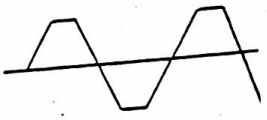
When R_1 = C_1 =

R_2 = C_2 =

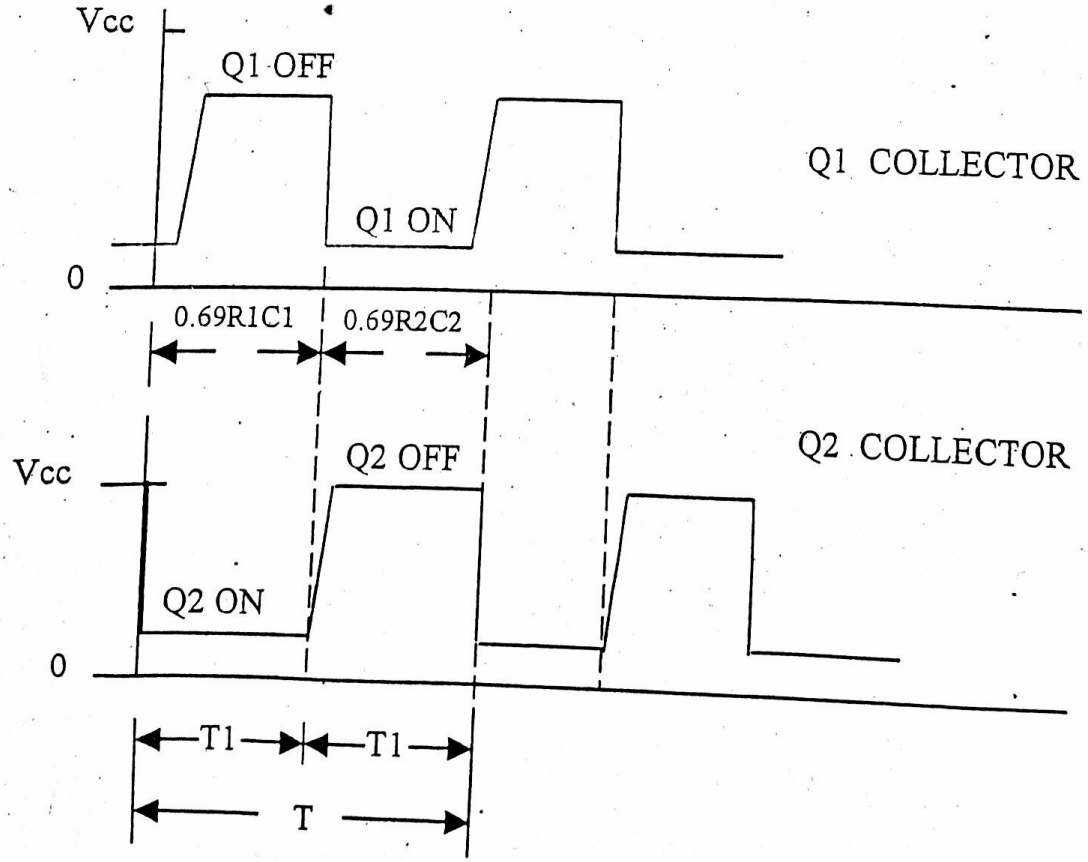
Theoretical value of the frequency = KHz (from calculation)

Measured value of the frequency = KHz.


Vcc
S
RL1
R2
R1
RL2
A
B
C2
C1
C
VC1
Q1
Q2
VC1



OUTPUT WAVE


Vcc
Q1 OFF
Q1 COLLECTOR
Q1 ON
0
0.69R1C1
0.69R2C2
Vcc
Q2 OFF
Q2 COLLECTOR
Q2 ON
0
T1
T1
T

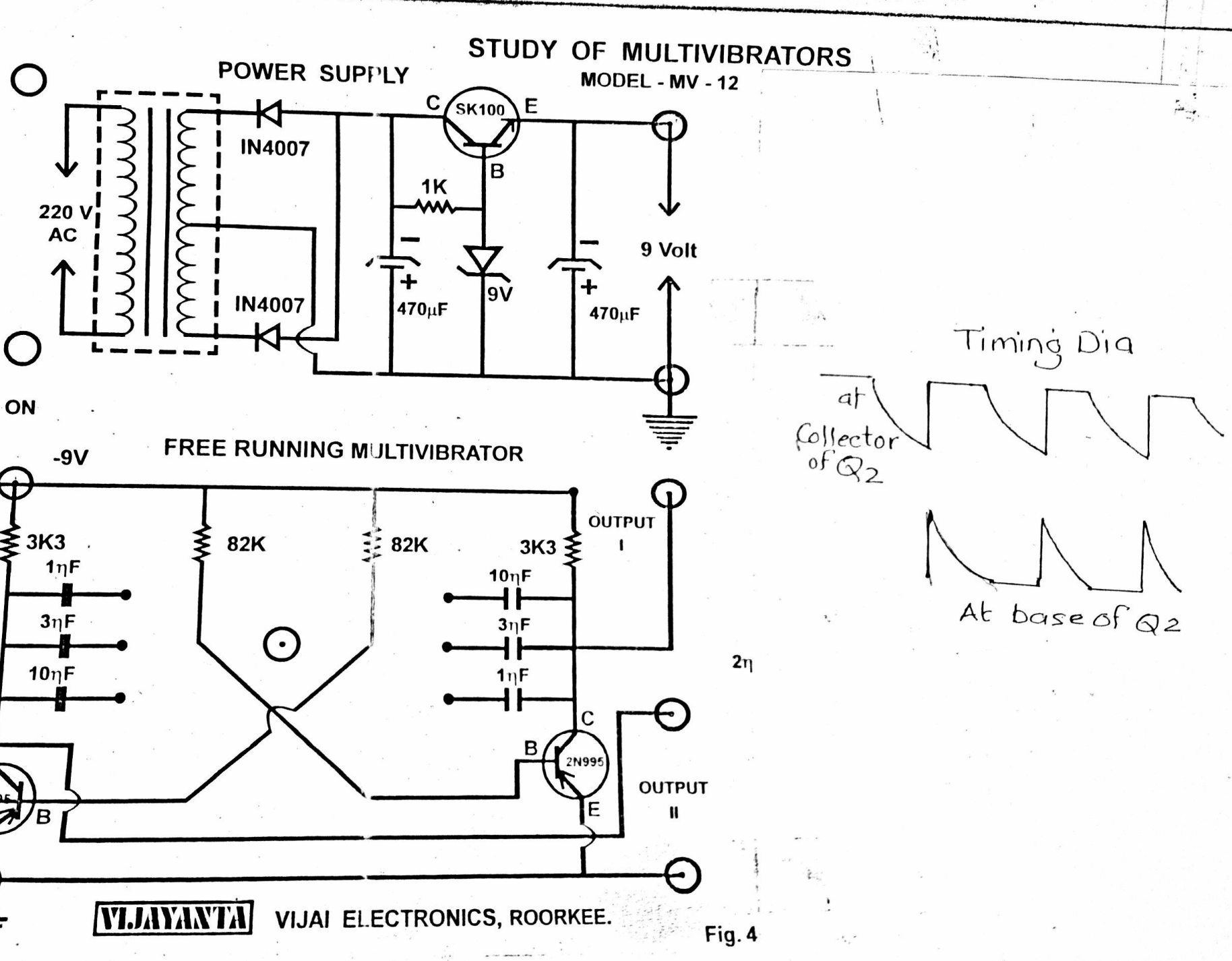

STUDY OF MULTIVIBRATORS
MODEL - MV - 12
POWER SUPPLY
220 V AC
IN4007
IN4007
SK100
C
E
B
1K
470μF
9V
470μF
9 Volt
ON
FREE RUNNING MULTIVIBRATOR
-9V
3K3
1ηF
3ηF
10ηF
82K
82K
3K3
10ηF
3ηF
1ηF
OUTPUT I
OUTPUT II
2N995
2N995
C
B
E
C
B
E
VIJAYANTA
VIJAI ELECTRONICS, ROORKEE.
Timing Dia
at Collector of Q2
At base of Q2
2η

Fig. 4