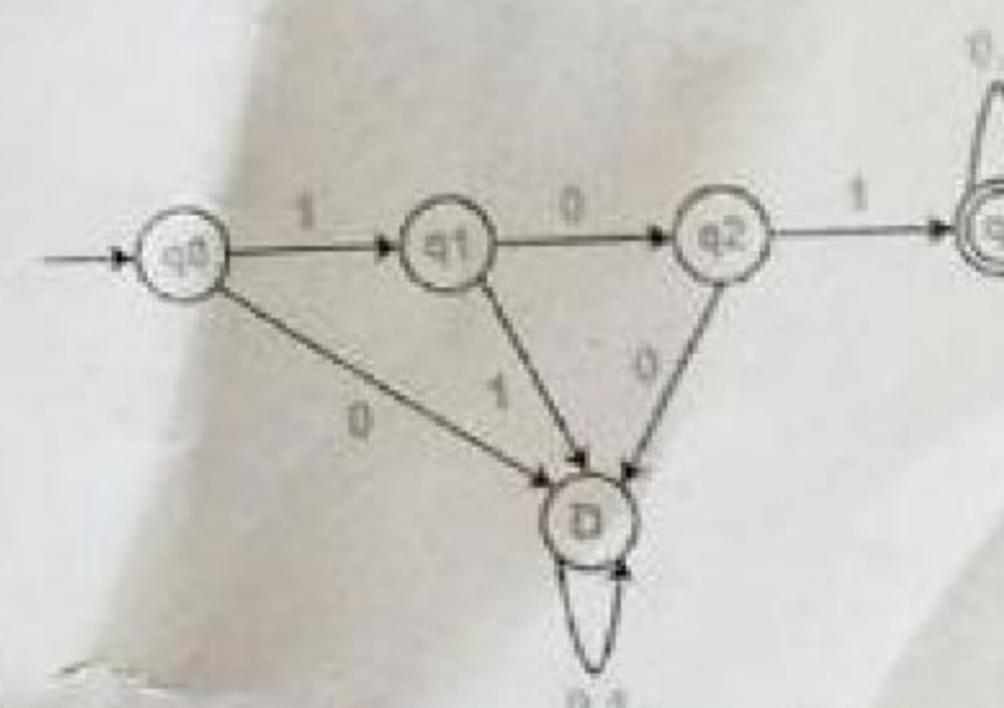
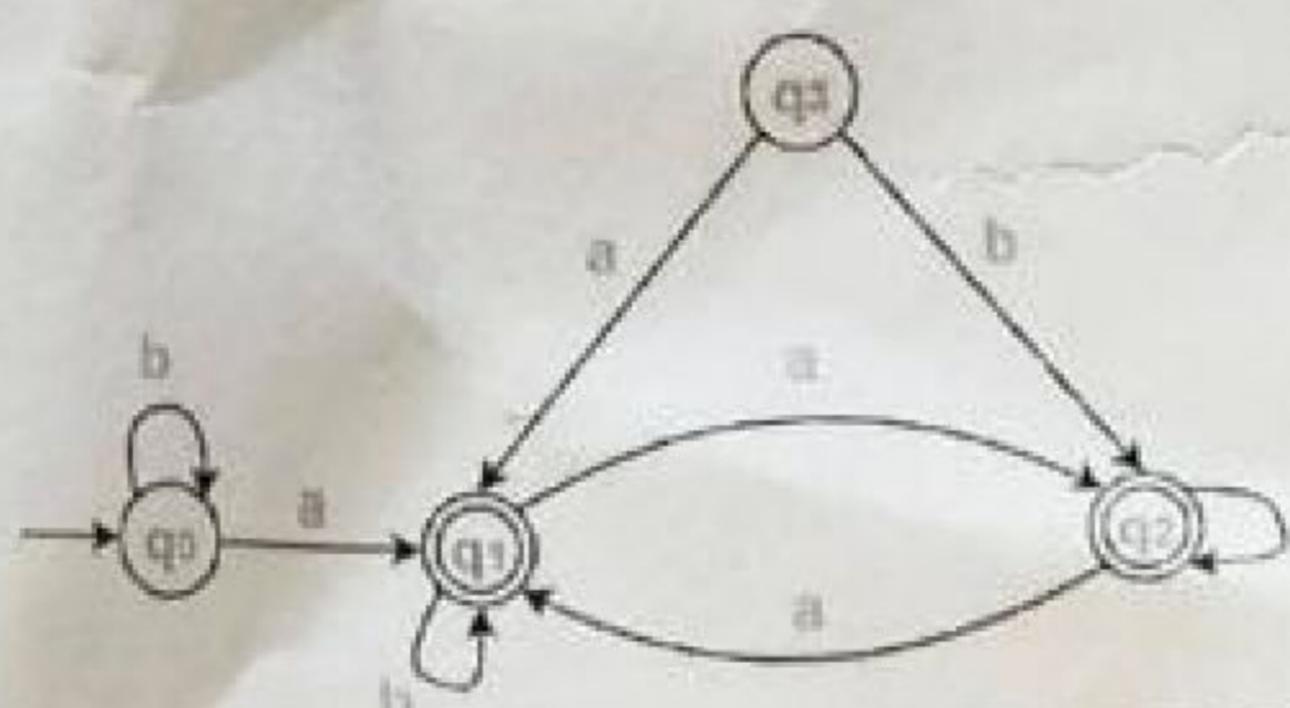


CT # 1 (SET-A)
Course Title: Theory of Computation (CSTE-2209)

Answer the following questions: (Marks: 25, Time: 50 Minutes)

Answer the following questions: (Marks: 25, Time: 50 Minutes)
Answer the following questions: (Marks: 25, Time: 50 Minutes)

	Define: (a) DFA, (b) Extended transition function for NFA, and (c) Membership problem.	1.5+2+1.5 =5
1.	Define: (a) DFA, (b) Extended transition function for NFA, and (c) Membership problem.	1.5+2+1.5 =5
2.	(a) Differentiate between complexity theory and computability theory. (b) Draw a DFA for the set of all strings ending in 010 over $\Sigma = \{0,1\}$. (c) Draw a DFA that accepts equal number of ab and ba over $\Sigma = \{a,b\}$.	2+4+4=10
3.	(a) Is a string 101101 accepted for the following DFA? Show your answer using extended transition function.  (b) Minimize the following DFA using equivalence theorem: 	4+6=10

3.5
4
4

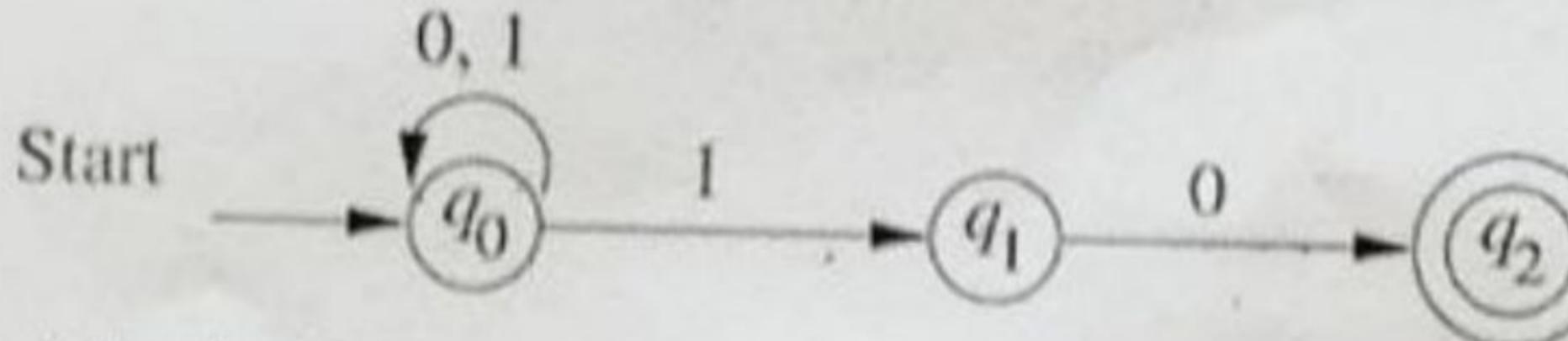
Answer the following questions: (Marks: 25, Time: 50 Minutes)

1.	Define: (a) NFA, (b) Extended transition function for DFA, (c) Language	1.5+1.5+2 =5
2.	(a) "More flexible memory results to the solution of more computational problems"-do you agree with the statement? Justify your answer accordingly. (b) Draw a DFA for the set of all strings ending in acb over $\Sigma = \{a,b,c\}$. (c) Draw a DFA for the set of all strings starting with b and ending with c over $\Sigma = \{a,b,c\}$.	2+4+4=10
3.	(a) Is a string abaaba accepted for the following DFA? Show your answer using extended transition function. (b) Convert the following NFA to DFA:\ using subset construction: 	4+6=10

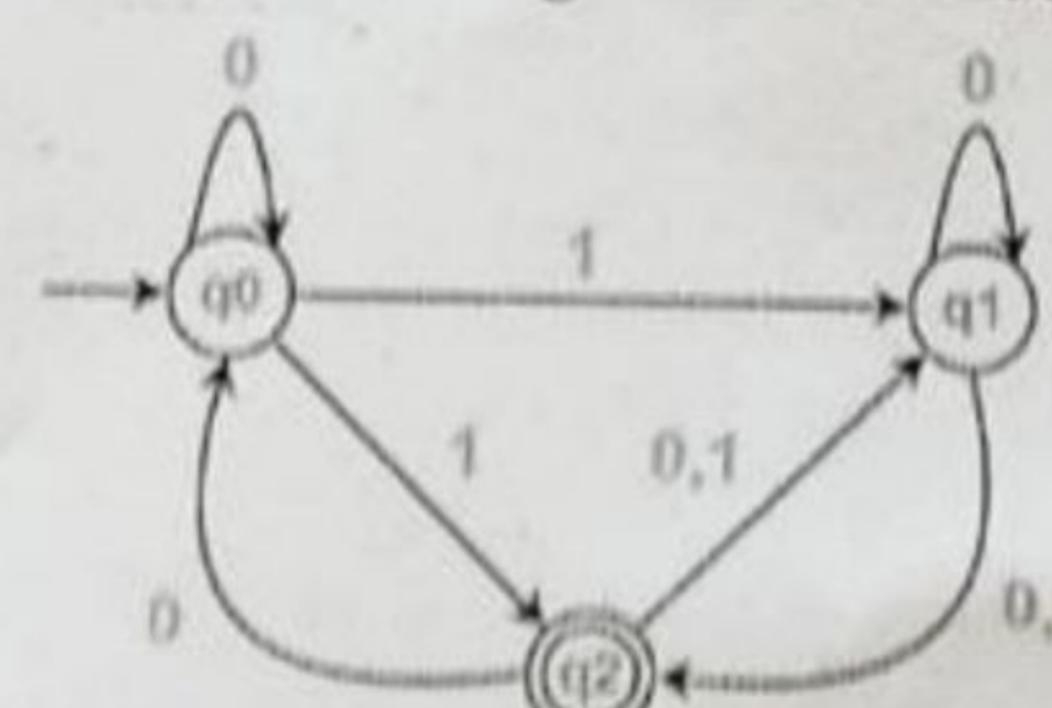
CT # 1 (SET-C)
Course Title: Theory of Computation (CSTE-2209)

Answer the following questions: (**Marks: 25, Time: 50 Minutes**)

1.	Define: (a) Language of NFA, (b) Corollary, (c) Epsilon-closure	1.5+1.5+2 =5
2.	(a) What are the differences between Kleene closure and Positive closure? Explain. (b) Draw a DFA for the set of all strings with two consecutive 0's followed by two consecutive 1's over $\Sigma = \{0,1\}$ (c) Draw a DFA to accept strings over $\Sigma = \{a,b\}$ with length <i>at least n</i> .	2+4+4=10
3.	(a) Is a string 001001 accepted for the following NFA? Show your answer using extended transition function.	4+6=10

Start 

 (b) Convert the following NFA to DFA using subset construction:



CT # 2 (SET-A)
Course Title: Theory of Computation (CSTE-2209)

Answer the following questions: (Marks: 25, Time: 45 Minutes)

1.	(a) Why pumping lemma is required? Write down the properties of pumping lemma. (b) What do you mean by an ambiguous grammar? Explain with an example.	1+2=3
2.	(a) Draw an automaton for the RE $ba^*(a+b)^*$. (b) Consider the following grammar: $\begin{array}{l} S \rightarrow A1B \\ A \rightarrow 0A \mid \epsilon \\ B \rightarrow 0B \mid 1B \mid \epsilon \end{array}$ Show the left-most and right-most derivation for the string 00101.	2 5 5
3.	Consider the following transition table for a DFA: $\begin{array}{c cc c} & \mid 0 & \mid 1 & \\ \hline \rightarrow q_1 & q_2 & q_3 & \\ q_2 & q_1 & q_3 & \\ *q_3 & q_2 & q_1 & \end{array}$ a) Give all the regular expressions $R_{ij}^{(0)}$. b) Give all the regular expressions $R_{ij}^{(1)}$. c) Give all the regular expressions $R_{ij}^{(2)}$.	10

CT # 2 (SET-B)
Course Title: Theory of Computation (CSTE-2209)

Answer the following questions: (Marks: 25, Time: 45 Minutes)

1.	(a) Define Arden's Theorem. (b) What do you mean by Context-Free Grammar? Explain with an example.	2 3
2.	(a) Convert the following DFA to a RE by using state-elimination technique:	5
	$ \begin{array}{c cc} & 0 & 1 \\ \hline \rightarrow *p & s & p \\ q & p & s \\ r & r & q \\ s & q & r \end{array} $ (b) Prove that $L=\{0^n10^n \mid n \geq 1\}$ is not a regular language.	5
3.	Consider the following grammar and show a derivation tree for the string $a + b * c$: $E \rightarrow E+E \mid E^*E \mid a \mid b \mid c$ Then prove that the grammar is an ambiguous grammar and show how to eliminate ambiguity from the grammar.	10

CT # 2 (SET-C)
Course Title: Theory of Computation (CSTE-2209)

Answer the following questions: (Marks: 25, Time: 45 Minutes)

1.	(a) What are the main reasons that lead to ambiguity of a grammar? How we can eliminate ambiguity from a grammar? (b) How can you construct a parse tree from a grammar? Explain.	1+1=2 3
2.	Consider the following transition table for a DFA: $ \begin{array}{c cc} & 0 & 1 \\ \hline \rightarrow q_1 & q_2 & q_1 \\ q_2 & q_3 & q_1 \\ *q_3 & q_3 & q_2 \end{array} $ a) Give all the regular expressions $R_{ij}^{(0)}$. b) Give all the regular expressions $R_{ij}^{(1)}$. c) Give all the regular expressions $R_{ij}^{(2)}$.	10
3.	(a) Prove that $L=\{0^n1^m2^n \mid n \text{ and } m \text{ are arbitrary integers}\}$ is not a regular language. (b) Consider the following grammar: $E \rightarrow +EE \mid *EE \mid -EE \mid x \mid y$ Show derivation tree for the string $+^*xyxy$ and prove that the grammar is unambiguous.	5 5

A₁ A₂
Z A₁ A₂
A₁

CT # 3 (SET-A)

Course Title: Theory of Computation (CSTE-2209)

Answer the following questions: (Marks: 25, Time: 40 Minutes)

		5
1.	Explain the formal notations for Pushdown Automata (PDA).	2+3+2+3 =10
2.	Consider the following grammar: $\begin{array}{l} S \rightarrow 0A0 \mid 1B1 \mid BB \\ A \rightarrow C \\ B \rightarrow S \mid A \\ C \rightarrow S \mid \epsilon \end{array}$ (i) Eliminate ϵ -productions. (ii) Eliminate any unit-productions in the resulting grammar. (iii) Eliminate any useless symbols in the resulting grammar. (iv) Put the grammar into Chomsky Normal Form.	P1
3.	(a) Design a pushdown automata for the language $L = \{a^i b^j c^k \mid i, j, k \geq 0 \text{ and } i=k \text{ or } j=k\}$ (b) Eliminate left recursion from the following grammar: $A \rightarrow AA\alpha \mid \beta$	6 4
		/ 2*3

CT # 3 (SET-B)

Course Title: Theory of Computation (CSTE-2209)

Answer the following questions: (Marks: 25, Time: 40 Minutes)

1. Define Chomsky Normal Form (CNF). When a symbol is useful for a grammar? Explain.	2+3
2. Consider the following grammar: $\begin{array}{l} S \rightarrow 0A0 \mid 1B1 \mid BB \\ A \rightarrow C \\ B \rightarrow S \mid A \\ C \rightarrow S \mid \epsilon \end{array}$ <ul style="list-style-type: none"> (i) Eliminate ϵ-productions. (ii) Eliminate any unit-productions in the resulting grammar. (iii) Eliminate any useless symbols in the resulting grammar. (iv) Put the grammar into Chomsky Normal Form. 	2+3+2+3 =10
3. (a) Design a pushdown automata for the language $L=\{a^i b^j c^k \mid i,j,k \geq 0 \text{ and } i=j \text{ or } j=k\}$ (b) Eliminate left recursion from the following grammar: $E \rightarrow EE^+ \mid EE^* \mid a$	6 4

CT # 3 (SET-C)

Course Title: Theory of Computation (CSTE-2209)

Answer the following questions: (Marks: 25, Time: 40 Minutes)

1.	What do you mean by Greibach Normal Form (GNF)? List the steps for converting a CFG to a GNF.	2+3
2.	Consider the following grammar: $\begin{array}{l} S \rightarrow ASB \mid \epsilon \\ A \rightarrow aAS \mid a \\ B \rightarrow SbS \mid A \mid bb \end{array}$ (v) Eliminate ϵ -productions. (vi) Eliminate any unit-productions in the resulting grammar. (vii) Eliminate any useless symbols in the resulting grammar. (viii) Put the grammar into Chomsky Normal Form.	2+3+2+3 =10
3.	(a) Design a pushdown automata for the language $L = \{a^i b^j c^k \mid i, j, k \geq 0 \text{ and } i=k \text{ or } j=k\}$ (b) Eliminate left recursion from the following grammar: $S \rightarrow S0S1S \mid 01$	6 4

Department of Computer Science and Technology, University
2nd Year 3rd Term & 7th Semester, Information Engineering
Control Code: 13311E-23001 Course Title: Object Oriented Programming
Name: PI Manisha J. Kumar
Answer the following questions. (Topics in the right hand margin indicate which category are
your half marks)

Mark: 25

Q1. What is the output of the following program?

```
public class Test {  
    public static void main(String args) {  
        System.out.println("Hello world");  
        System.out.println("Hello world");  
    }  
}
```

Ans: Hello world

Q2. What is the output of the following program?

```
public class Test {  
    public static void main(String args) {  
        System.out.println("Hello world");  
        System.out.println("Hello world");  
    }  
}
```

Ans: Hello world

Q3. What is the output of the following Java program?

```
public class Test {  
    public static void main(String args) {  
        int a = 1;  
        int b = 2;  
        int c = a / b;  
    }  
}
```

Ans: 0

Q4. What is the output of the following Java program?

```
public class Test {  
    public static void main(String args) {  
        System.out.println("Hello world");  
        System.out.println("Hello world");  
    }  
}
```

Ans: Hello world

Q5. What is the output of the following Java program?

```
public class Test {  
    public static void main(String args) {  
        System.out.println("Hello world");  
        System.out.println("Hello world");  
    }  
}
```

Ans: Hello world

Q6. What is the output of the following program?

```
public class Test {  
    public static void main(String args) {  
        System.out.println("Hello world");  
        System.out.println("Hello world");  
    }  
}
```

Ans: Hello world

Q7. What is the output of the following program?

```
public class Test {  
    public static void main(String args) {  
        System.out.println("Hello world");  
        System.out.println("Hello world");  
    }  
}
```

Ans: Hello world

Q8. What is the output of the following Java program?

```
public class Test {  
    public static void main(String args) {  
        System.out.println("Hello world");  
        System.out.println("Hello world");  
    }  
}
```

Ans: Hello world

Q9. What is the output of the following Java program?

```
public class Test {  
    public static void main(String args) {  
        System.out.println("Hello world");  
        System.out.println("Hello world");  
    }  
}
```

Ans: Hello world

Q10. What is the output of the following Java program?

```
public class Test {  
    public static void main(String args) {  
        System.out.println("Hello world");  
        System.out.println("Hello world");  
    }  
}
```

Ans: Hello world

Q11. What is the output of the following Java program?

```
public class Test {  
    public static void main(String args) {  
        System.out.println("Hello world");  
        System.out.println("Hello world");  
    }  
}
```

Ans: Hello world

Ans:

Q57. What is multithreaded programming?
1) It's a process in which two different processes run simultaneously.
2) It's a process in which two or more parts of same process run simultaneously.
3) It's a process in which many different process are able to access same information.
4) It's a process in which a single process can access information from many sources.

Remember 1

Q58. Which of these are types of multitasking?
1) Process based
2) Thread based
3) Process and Thread based
4) None of the mentioned

Remember 1

Q59. Thread priority in Java is?
1) int
2) float
3) double
4) long

Remember 2

Q60. What will happen if two threads of the same priority are called to be processed simultaneously?
1) Anyone will be executed first lexicographically
2) Both of them will be executed simultaneously
3) None of them will be executed
4) It is dependent on the operating system

Understand 2

Q61. What will be the output of the following Java code?

```
class multithreaded_programming
{
    public static void main(String args[])
    {
        Thread t = Thread.currentThread();
        System.out.println(t);
    }
}
```

a) Thread[main]
b) Thread[main,5]
c) Thread[main,0]
d) Thread[main,5 main]

Analyze 3

Q62. What is the name of the thread in the following Java Program?

```
class multithreaded_programming
{
    public static void main(String args[])
    {
        Thread t = Thread.currentThread();
        System.out.println(t);
    }
}
```

a) Main
b) Thread
c) System
d) None of the mentioned

Analyze 2

1. 02. For $x(t)$ given as follows

$$x(t) = t, \quad 0 < t \leq 1$$

$$= 1, \quad 1 < t \leq 2$$

$$= 0, \text{ otherwise}$$

Plot and find the analytic expression for the following:



- 2.

The sum of two periodic signals is periodic only if the ratio of their respective periods can be expressed as a rational number.

- 3.

Consider the system output as $y(t)$ and determine if the system is:-

05

04

iv. $y(t) = x(t) + x(t-1) + x(t+1)$; static, dynamic, causal, non-causal, with memory or memory-less.

v. $y(t) = 3 + x(t)$; invertible or non-invertible

vi. $y(t) = e^{j\omega t}$ for $|x(t)| \leq 6$; BIBO stable or Unstable.

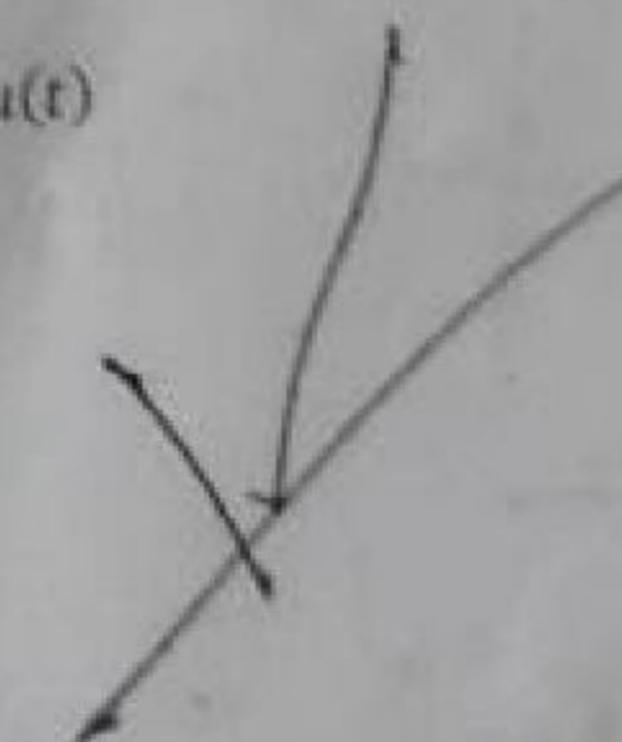
Calculate the convolution integral of two signals: $x(t) = u(t)$, $h(t) = e^{-t}u(t)$

06

02

- 4.

What is the relation between ramp signal and step signal?



Set - A

CT-02 Date: 19/12/2022

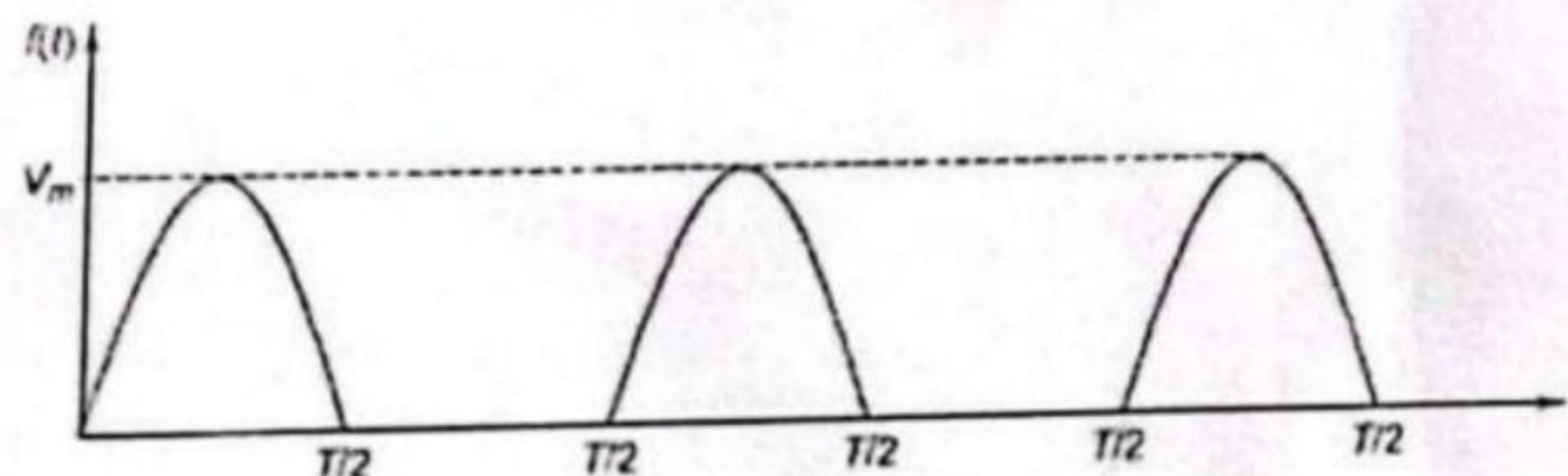
Course Title: Signals and Systems

Course Code: CSTE-2205

Time: 50 minute

Marks 25

1. What is Fourier Series expansion? Why Fourier Series expansion is needed in signals and systems? 1+3
2. Expand Trigonometric Fourier Series indicating all Fourier co-efficients? In which condition Fourier co-efficients will be zero? 05
3. Establish the relationship between trigonometric and exponential Fourier series. 06
4. Find Trigonometric series for the following signal. 10



$$f(t) = \begin{cases} V_m \sin \omega t & \text{for } 0 \leq t \leq \frac{T}{2} \\ 0 & \text{for } \frac{T}{2} \leq t \leq T \end{cases}$$

Set - B

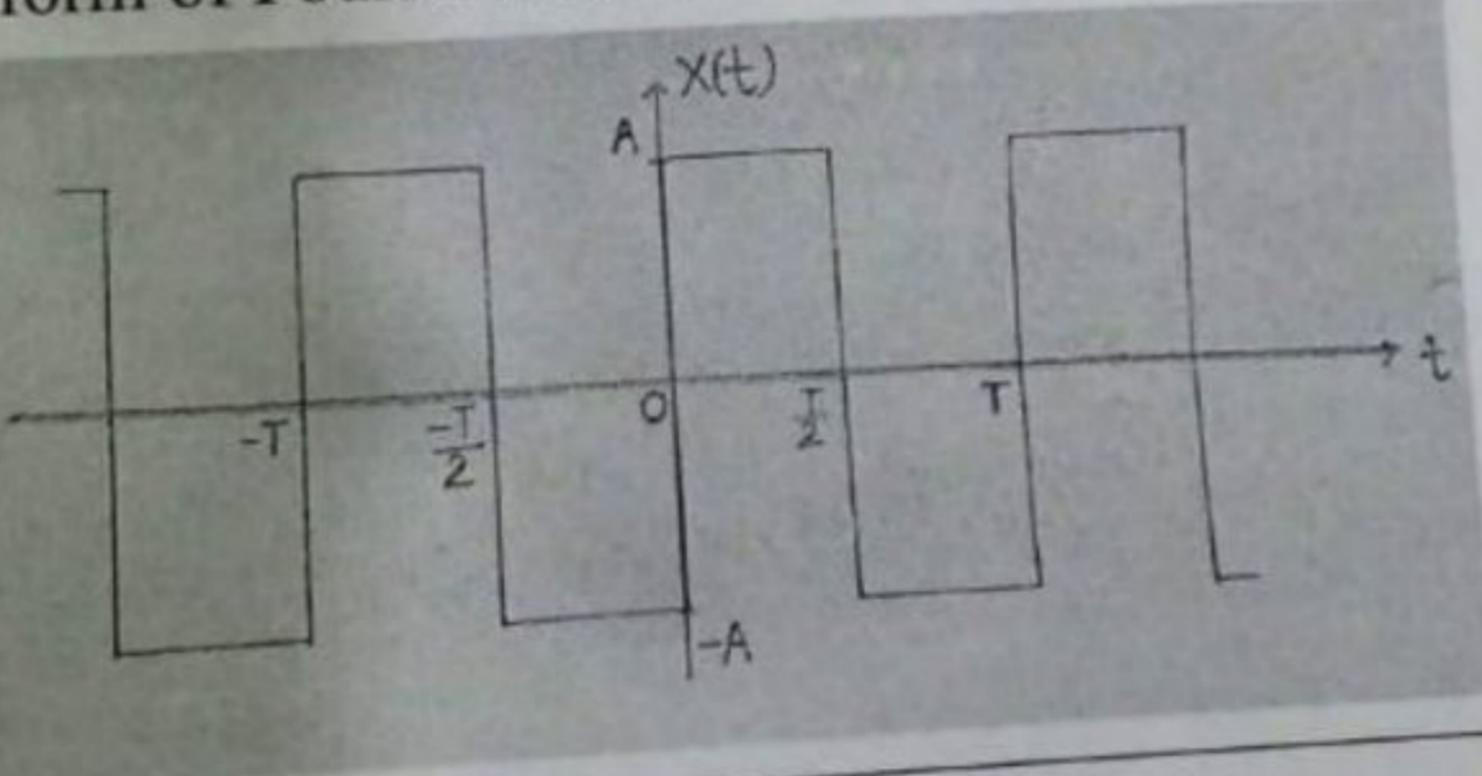
CT-02 Date: 19/12/2022

Course Title: Signals and Systems

Course Code: CSTE-2205

Time: 50 minute

Marks 25

1.	What is harmonic? Write an example indicating harmonics.	03
2.	Write about three Dirichlet Conditions for the existence of Fourier Series.	06
3.	Derive exponential Fourier series from trigonometric Fourier series	06
4.	Find the exponential form of Fourier Series: 	07
5.	Verify the time shifting property of Fourier Series.	03

$$\nabla \times \vec{B} = \mu_0 \epsilon_0 \frac{\partial \vec{E}}{\partial t}$$

ear-2, Term-2, sub: Electromagnetic wave and radiating system, session Lect: 2019-2020

1	State Faraday's law and Derive Maxwell's equation from Faraday's law.	2+5
2	Derive equation of continuity from Maxwell fourth equation.	5
3.	Write down word statement of Maxwell's equation.	6
4.	Let the component of electric field $E_x = E_0 e^{ikz}$, Calculate the component of magnetic field using Maxwell third equation. Hints: You can use $H = H_0 e^{-jwt}$.	7

Class Test: 1

Exam Date: 14-11-2022

Electronic Communication (CSTE-2207)

Total Marks: 25

1. What is a channel? Define 100BaseT cable. Write two examples for both wireless channel and wired channel. 2+2
2. Write three types of data with one example for each. Draw a 4 level digital signal. 3+3
3. Draw a time domain and frequency domain composite signal with frequency 0, 4 and 8 Hz respectively. 3
4. What is the bit rate? For a low pass channel with limited BW how much BW do we need to send data at 100 kbps bit rate? 1+1
5. Write the difference between the 2G and 3G technologies for telecommunication. Also write the difference between terrestrial and satellite microwave transmission. 2+2
6. Draw 4 network topologies. Write the function of the network layer of OSI reference model. 2+2

Class Test: 2

Exam Date: 01-12-2022

Electronic Communication (CSTE-2207)

Total Marks: 25

1. Why thermal noise cannot be eliminated from all electronic devices? An information source generates four messages S_1, S_2, S_3, S_4 with probabilities $\frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \frac{1}{8}$ respectively. Determine entropy of the system. 2+4
2. For the given symbol and probability find out the Huffman coding 5

Symbol	S_1	S_2	S_3	S_4	S_5	S_6
Probability	0.25	0.25	0.125	0.125	0.125	0.0625
3. Write the equation of Hartley-Nyquest error free coding. For a noisy channel, what will happen if $R < C$ (Where R is line rate and C is channel capacity)? Prove the equation $H = -\sum_{i=1}^n P_i \log (P_i)$. 2+2+4
4. Write the four types of connections can establish in a telecommunication network. Explain time division switch. 2+4

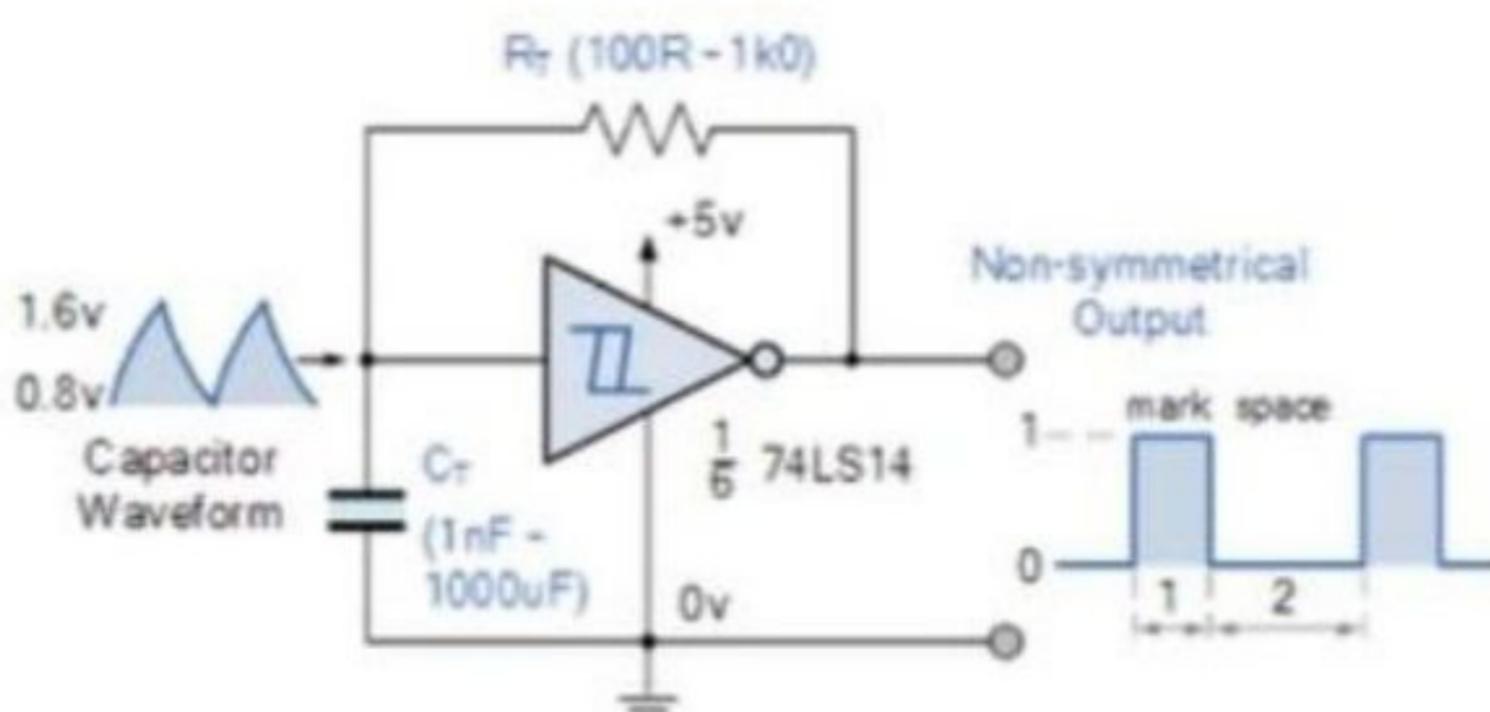
1.	What is random variable? Explain with example.	4
2.	Distinguish between probability mass function and probability density function.	5
3.	<p>Let X be a continuous random variable with the following PDF</p> $F_X(x) = ce^{-x} \quad x \geq 0$ <p>Otherwise $f_X(x) = 0$</p> <p>where c is a positive constant.</p> <p>a. Find c. b. Find the CDF of X, $F_X(x)$. c. Find $P(1 < X < 3)$</p>	6
4.	Let X be a continuous random variable with PDF $f(x) = 3x^2$ for $0 \leq x \leq 3$. Find mean, variance, β_1 and β_2 .	10

Class Test-2, Dept: CSTE, Sub: Probability and Statistics

1	Darw Z=x+iy in xy plane. Express complex number in polar and exponential form.	6
2	Find the modulus and argument of the following complex number $\frac{1-i}{1+i}$	5
3	Express $-5+5i$ in polar form.	5
4	Find all the solutions of $\cosh z=1$.	4
5	Describe the region determined by the relations $ \frac{z-2}{z+2} =2$	5

The LTP and UTP of the circuit are - 0/2

-----.

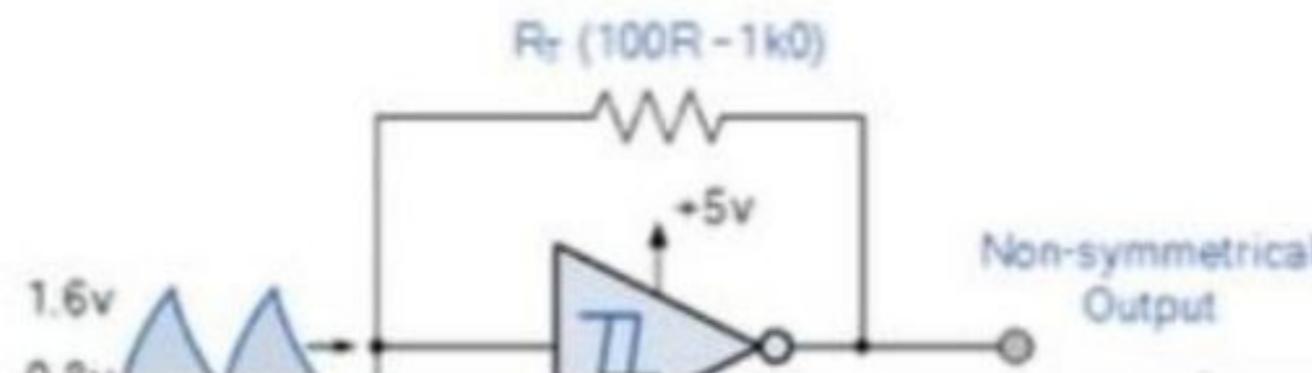


- A) 0v and 1v
- B) 0v and 5v
- C) 0.8v and 1.6v

Correct answer

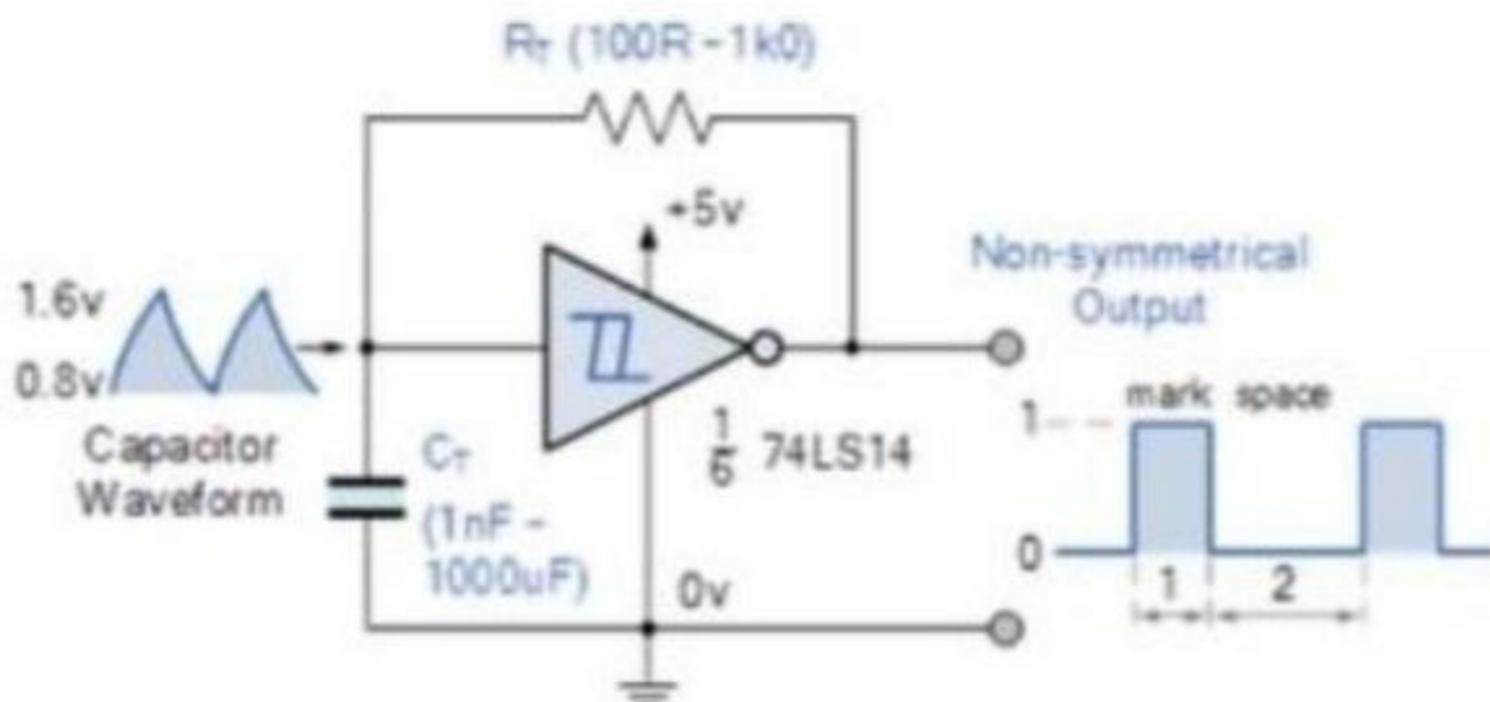
- C) 0.8v and 1.6v

The inverter used here is -----. 2/2





The inverter used here is -----.



- A) Schmitt Trigger
- B) inverter using Open collector output
- C) inverter using TTL
- D) inverter using OP-Amp

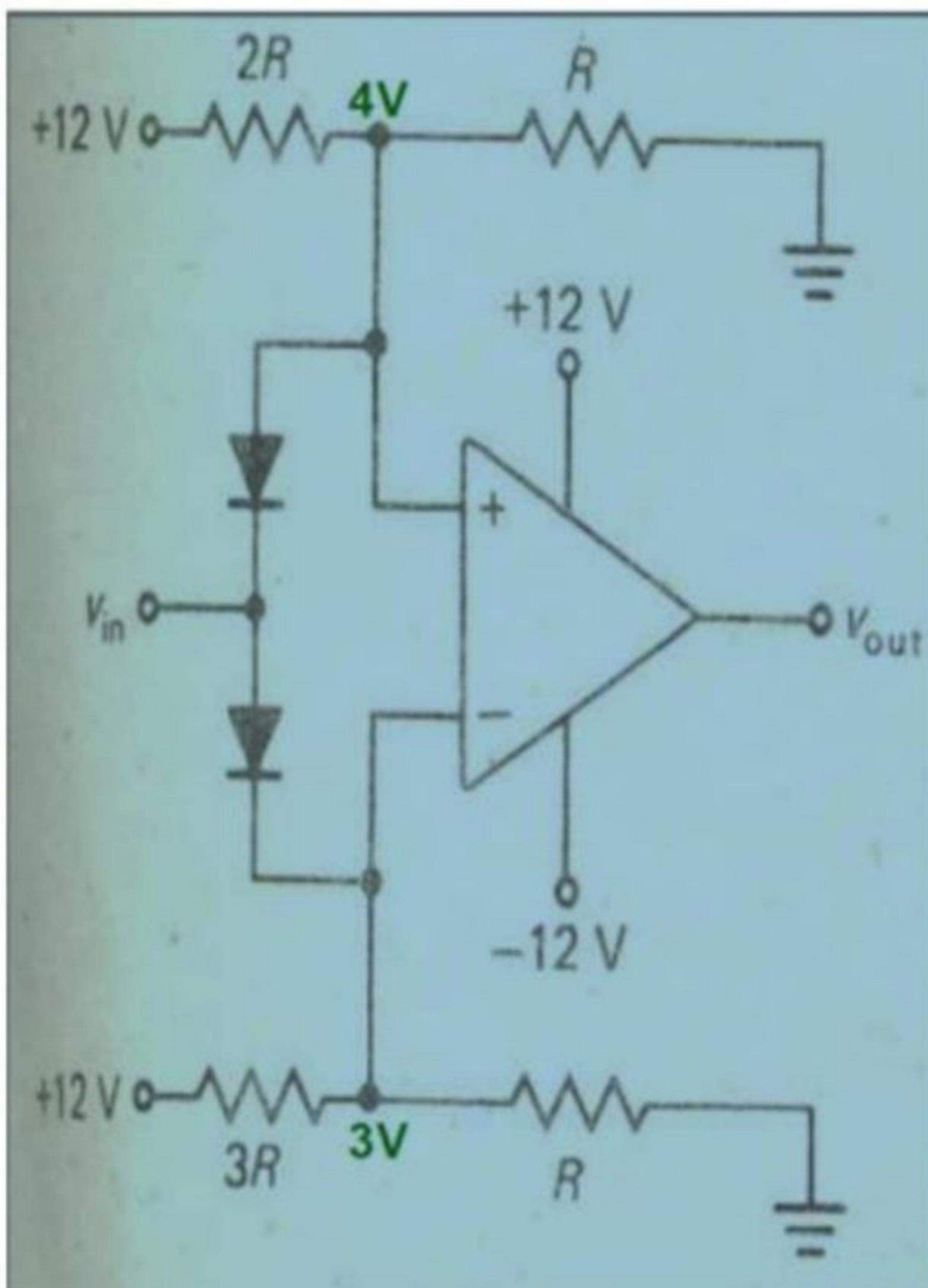
Feedback

A) Schmitt Trigger



The following circuit is -----.

1/1



- A) Bistable multivibrator
- B) Astable multivibrator
- C) Monostable multivibrator
- D) Schmitt trigger
- E) Window Comparator

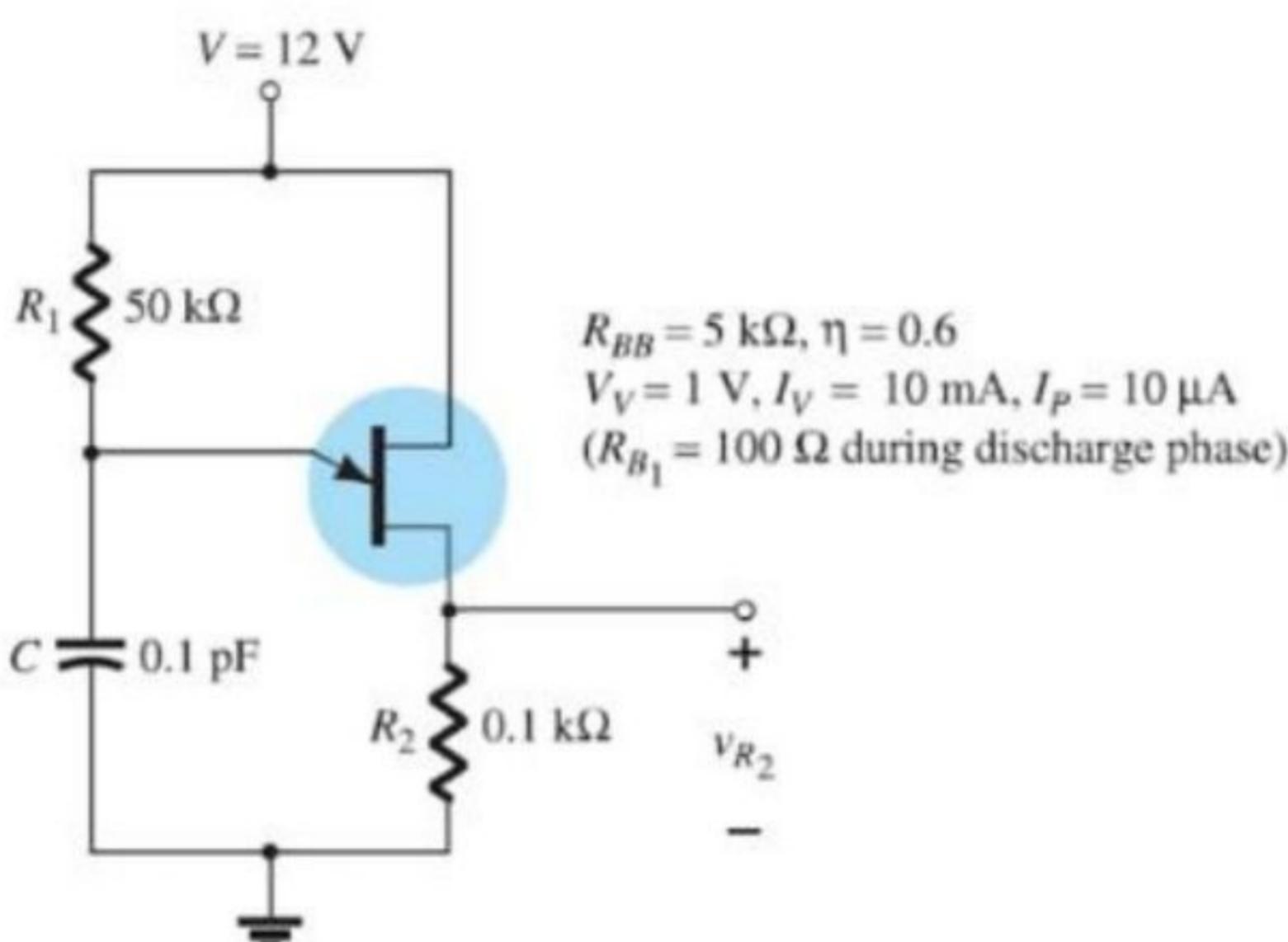


E) Window Comparator

Feedback

E) Window Comparator

Given the relaxation oscillator 0/2
using UJT. Determine RB1 and RB2
at the emitter current=0, use the
information beside the circuit.



A) $RB1 = 2K$, $RB2 = 3K$

B) $RB1 = 3K$, $RB2 = 2K$

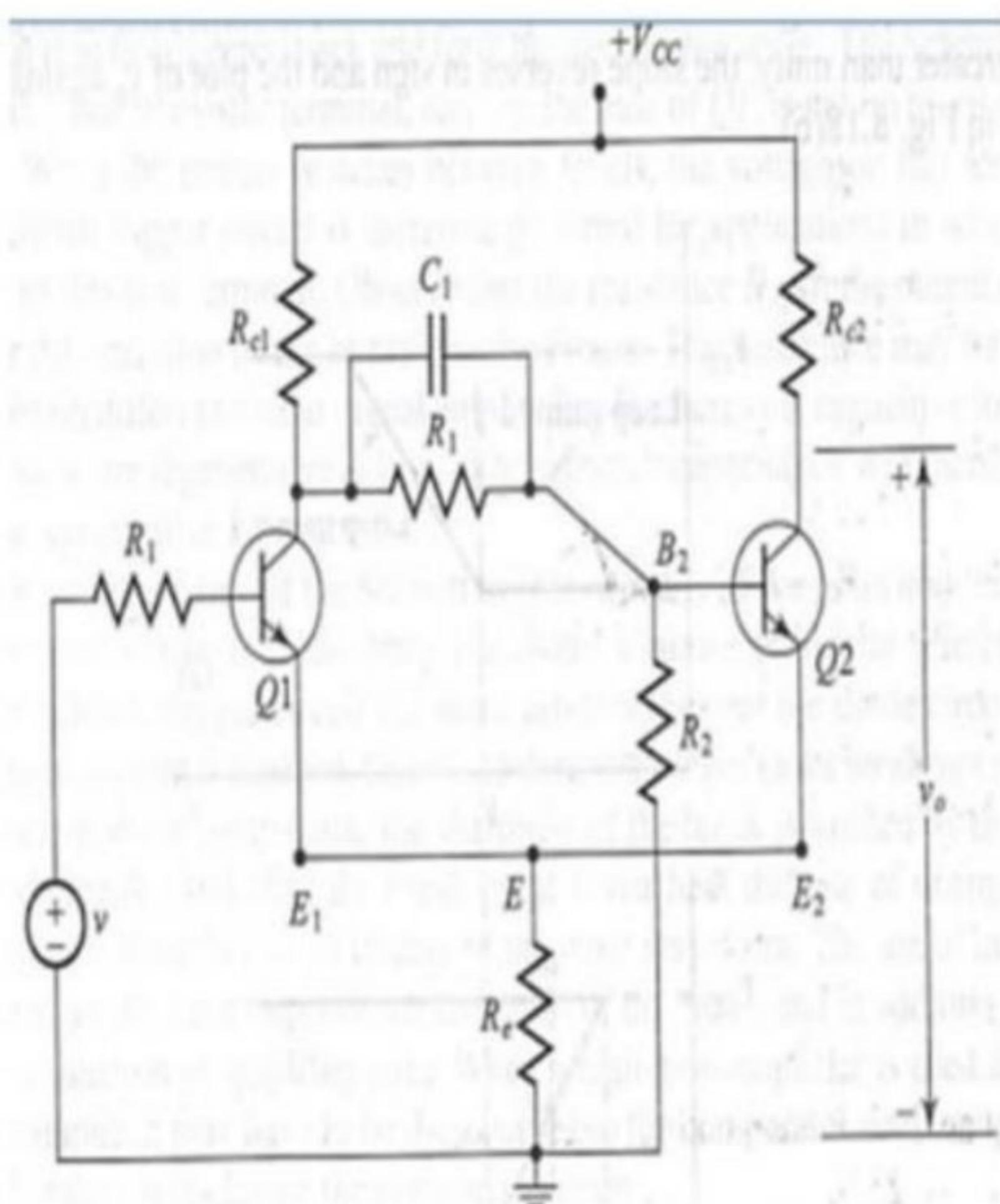


- B) $R_B1 = 3K$, $R_B2 = 2K$
- C) $R_B1 = 2.5K$, $R_B2 = 2.5K$

Correct answer

- B) $R_B1 = 3K$, $R_B2 = 2K$

After exceeding the UTP voltage of 0/2
the input the transistors ----



- A) Q1 ON, Q2 OFF

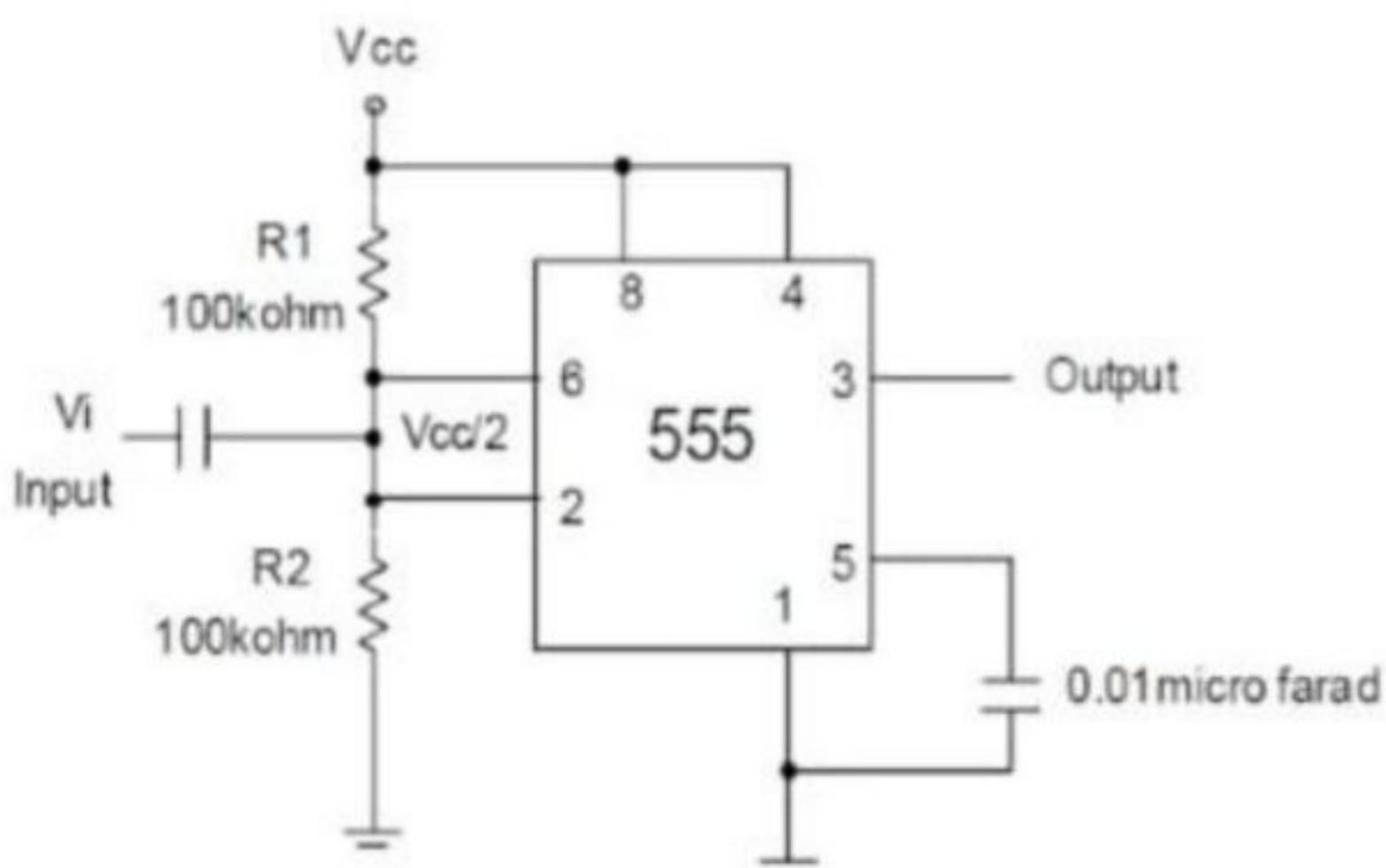


- A) Q1 ON, Q2 OFF
- B) Q1 ON, Q2 ON
- C) Q1 OFF, Q2 OFF
- D) Q1 OFF, Q2 ON

Correct answer

- A) Q1 ON, Q2 OFF

If the input voltage becomes lower than one-third of the Vcc, the output becomes -----.



- A) equals to +Vsat
- B) equals to input voltage



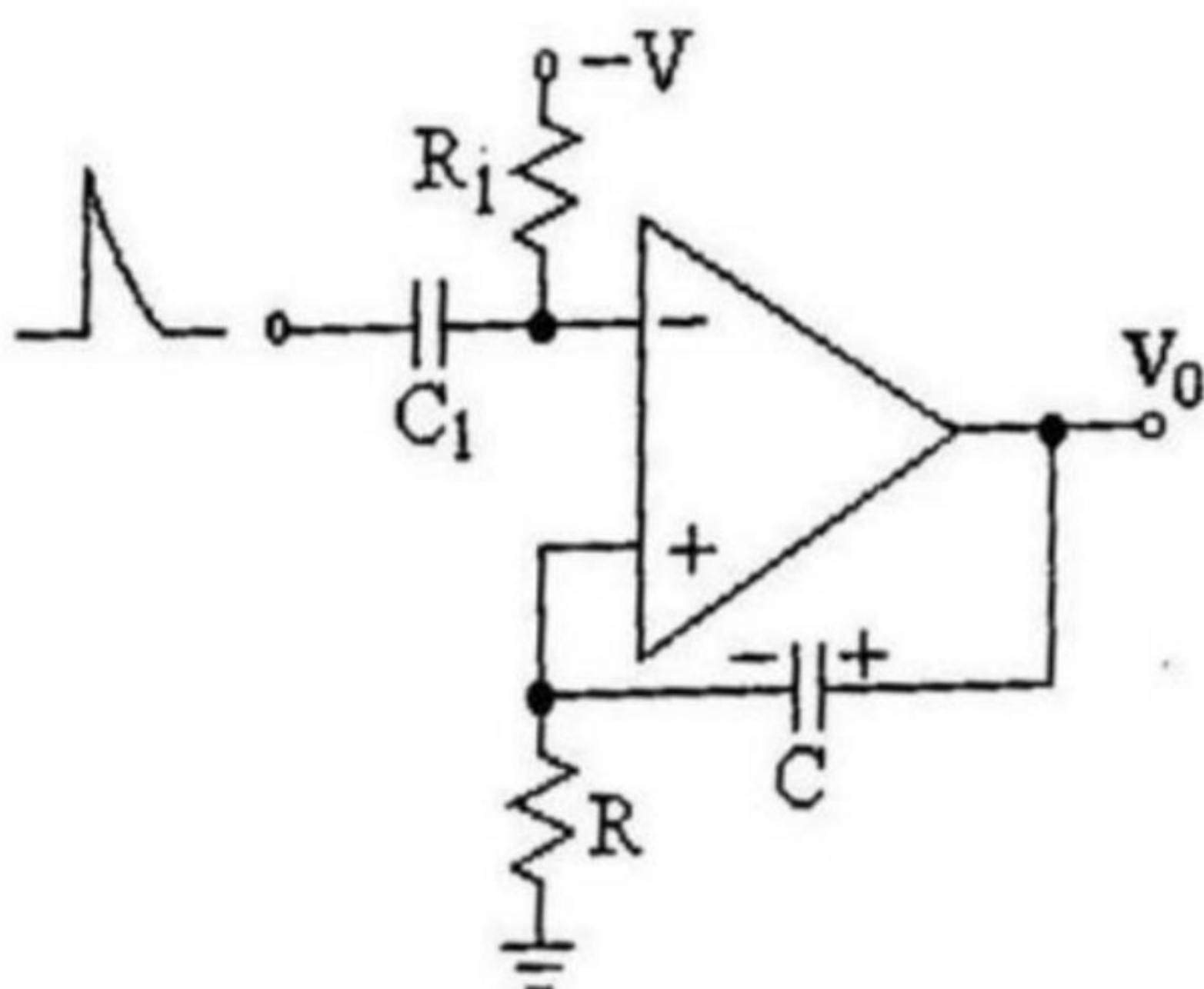


- A) equals to $+V_{sat}$
- B) equals to input voltage
- C) equals to $-V_{sat}$

Feedback

A) equals to $+V_{sat}$

After applying the trigger pulse the 2/2 output of the circuit becomes -----



- A) positive Vsat
- B) negative Vsat
- C) equals to voltage across C1
- D) 0v

Feedback

B) negative Vsat

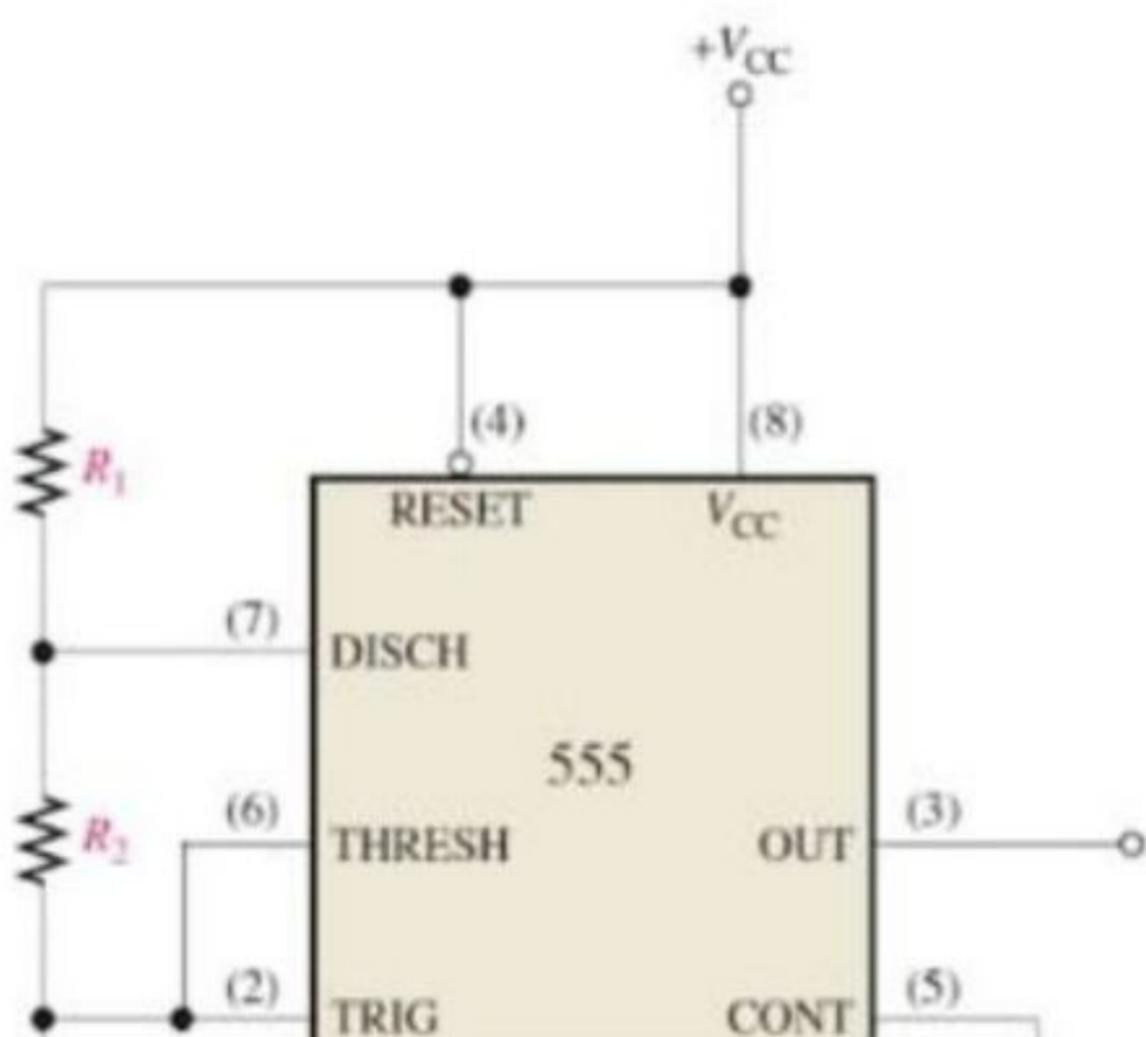
If the external resistor

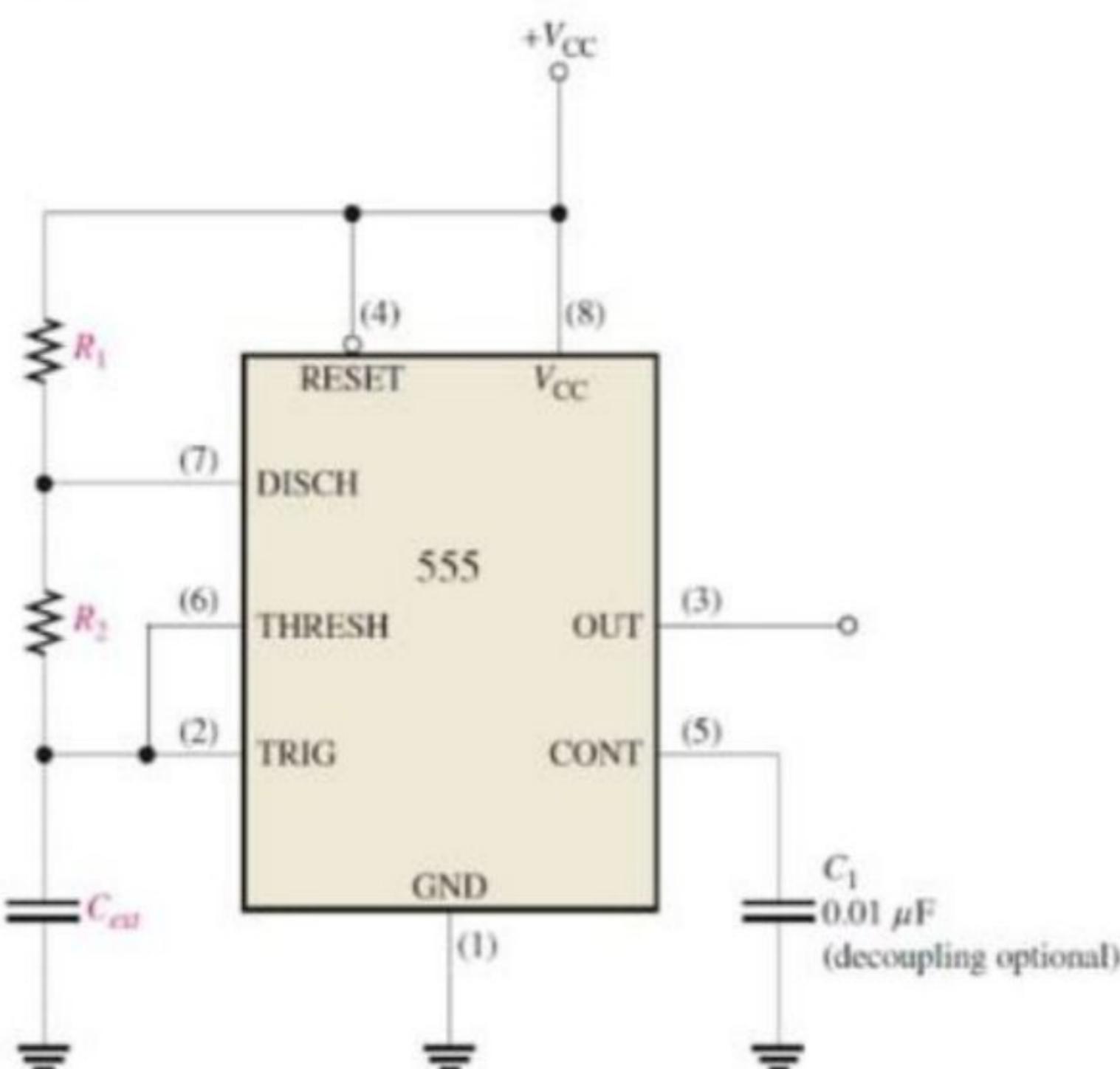
2/2

$R_1+2R_2=1.44K$ Ohms, capacitor

$C=1$ micro Farad, the output

frequency at pin 3 will be -----





- A) 10KHz
- B) 1KHz
- C) 1MHz
- D) 1.44MHz

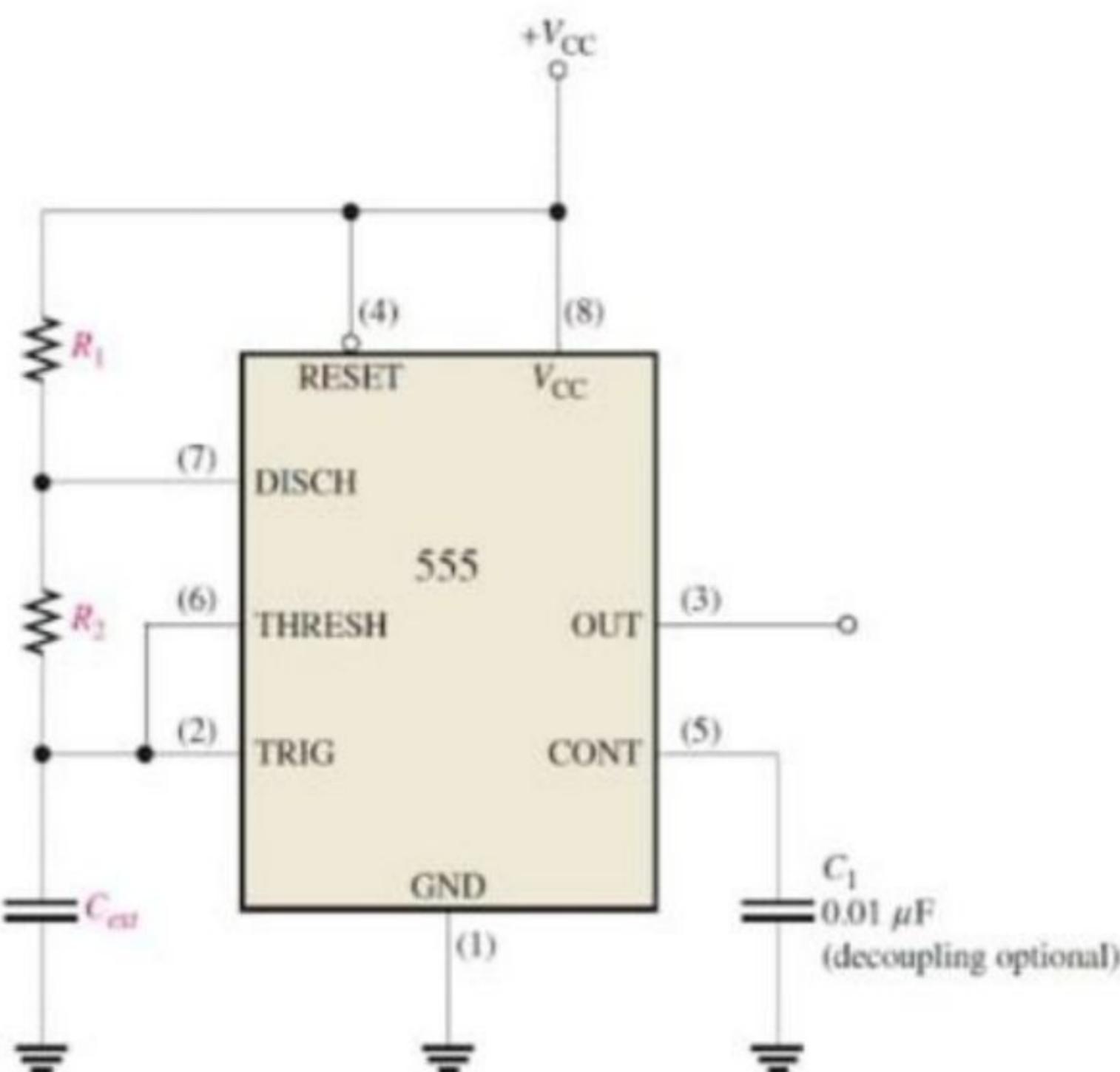
Feedback

B) 1KHz

If the capacitor voltage starts from 3/4v and ends at 8v with the target



If the capacitor voltage starts from $\frac{3}{4}V$ and ends at 8v with the target voltage 12v, $RC = \text{time}$ constant=1ms. Find the charging time $t = \text{_____ ms}$



- A) 5 ms
- B) 0.5 ms
- C) 1 ms
- D) 0.693 ms

Feedback



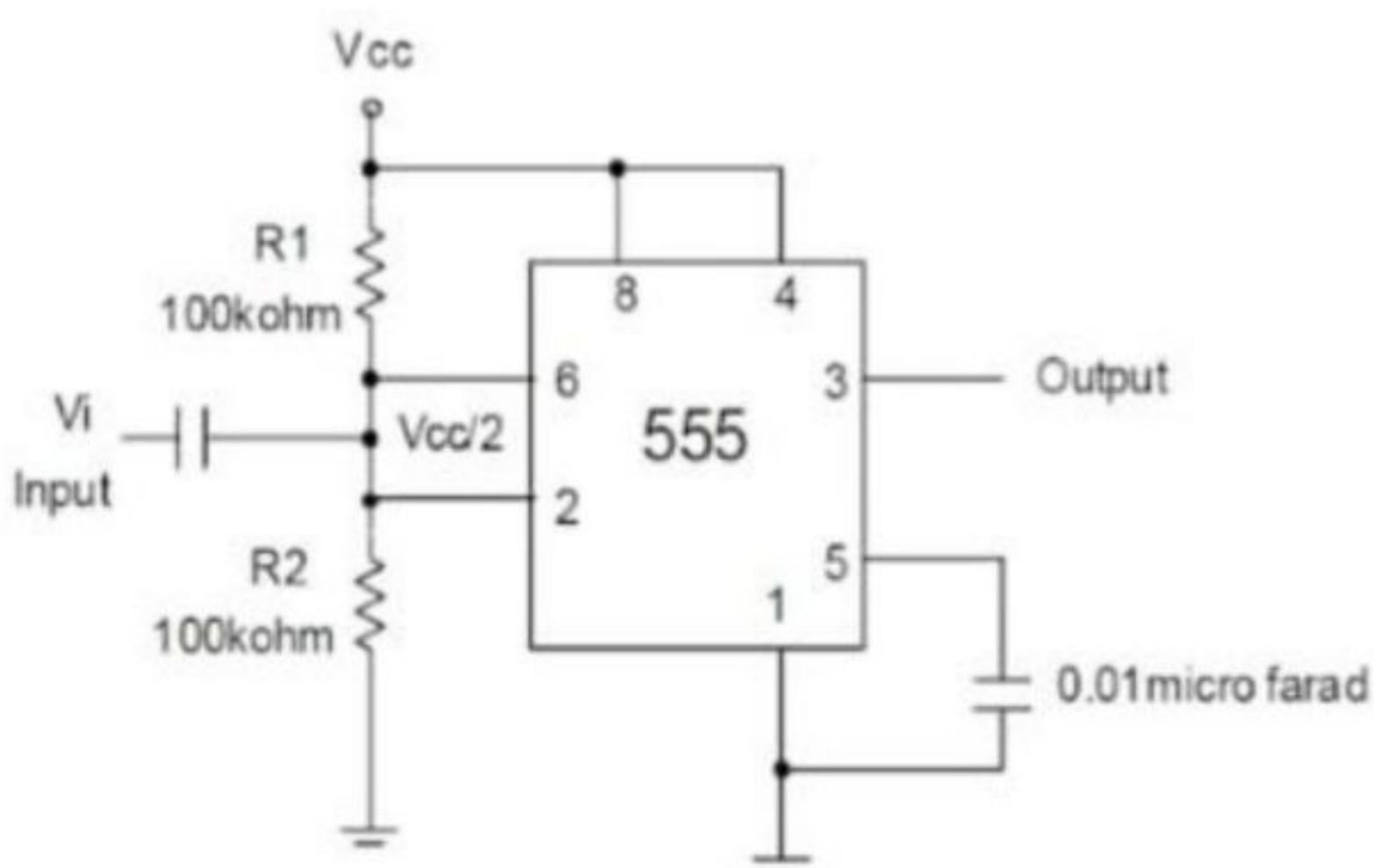
D) 0.693 ms

Feedback

D) 0.693 ms

If the input voltage becomes greater than two-thirds of the Vcc, the output becomes -----.

2/2



- A) equals to +Vs_{sat}
- B) equals to input voltage
- C) equals to -Vs_{sat}

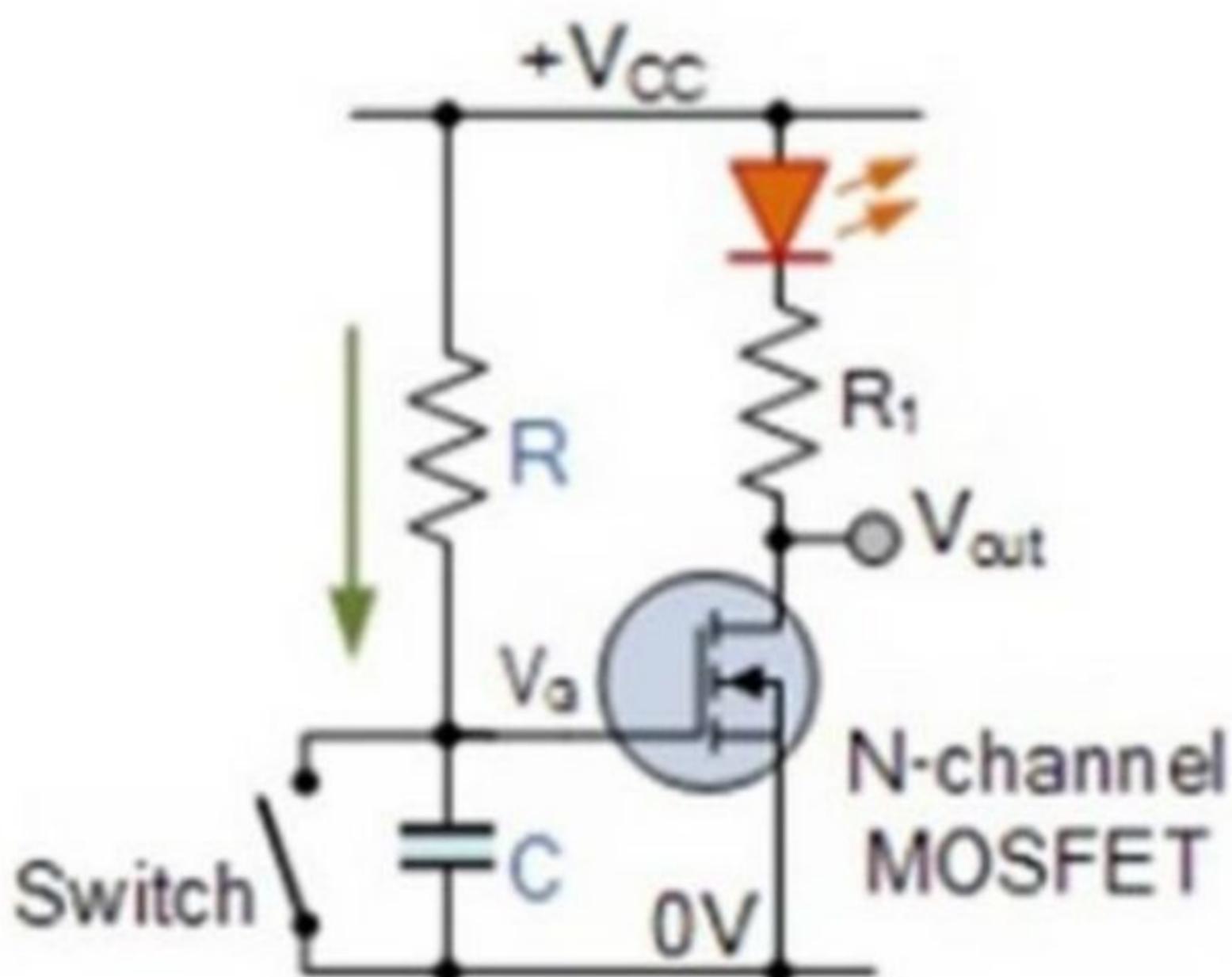


- C) equals to $-V_{sat}$

Feedback

C) equals to $-V_{sat}$

The following circuit is an example 1/1
of -----



- A) Bistable multivibrator
- B) Astable multivibrator
- C) Monostable multivibrator

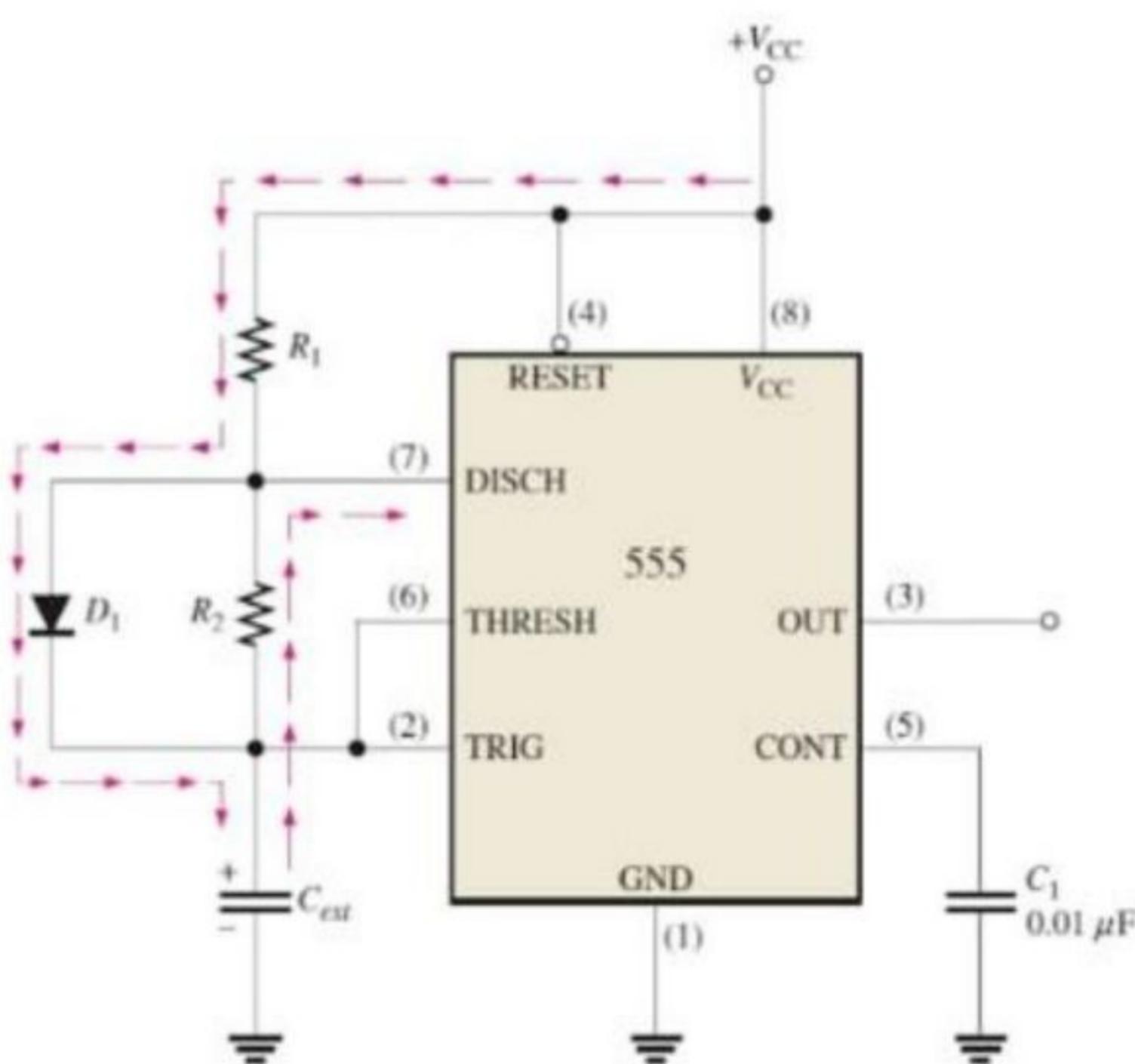


- C) Monostable multivibrator
- D) Schmitt trigger

Feedback

C) Monostable multivibrator

If we consider the diode D is ideal, 0/3
the duty cycle of the output
waveform will be ----



- A) 50%

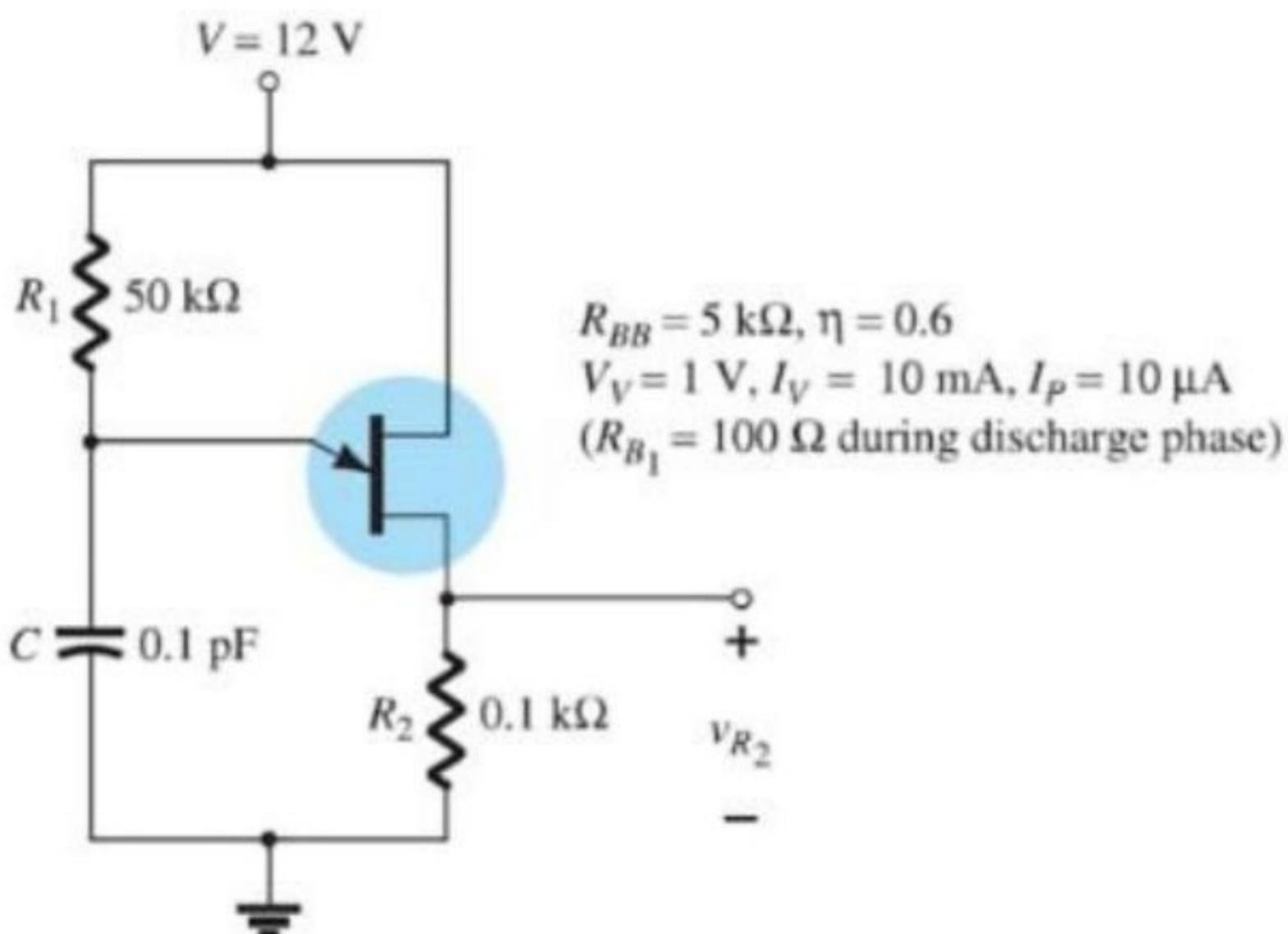


- A) 50%
- B) 33.33%
- C) 66.66%
- D) 60%

Correct answer

- A) 50%

Given the relaxation oscillator 0/2
using UJT. Find the frequency of
oscillation. [use the information
beside the circuit.]



- A) 500 KHz

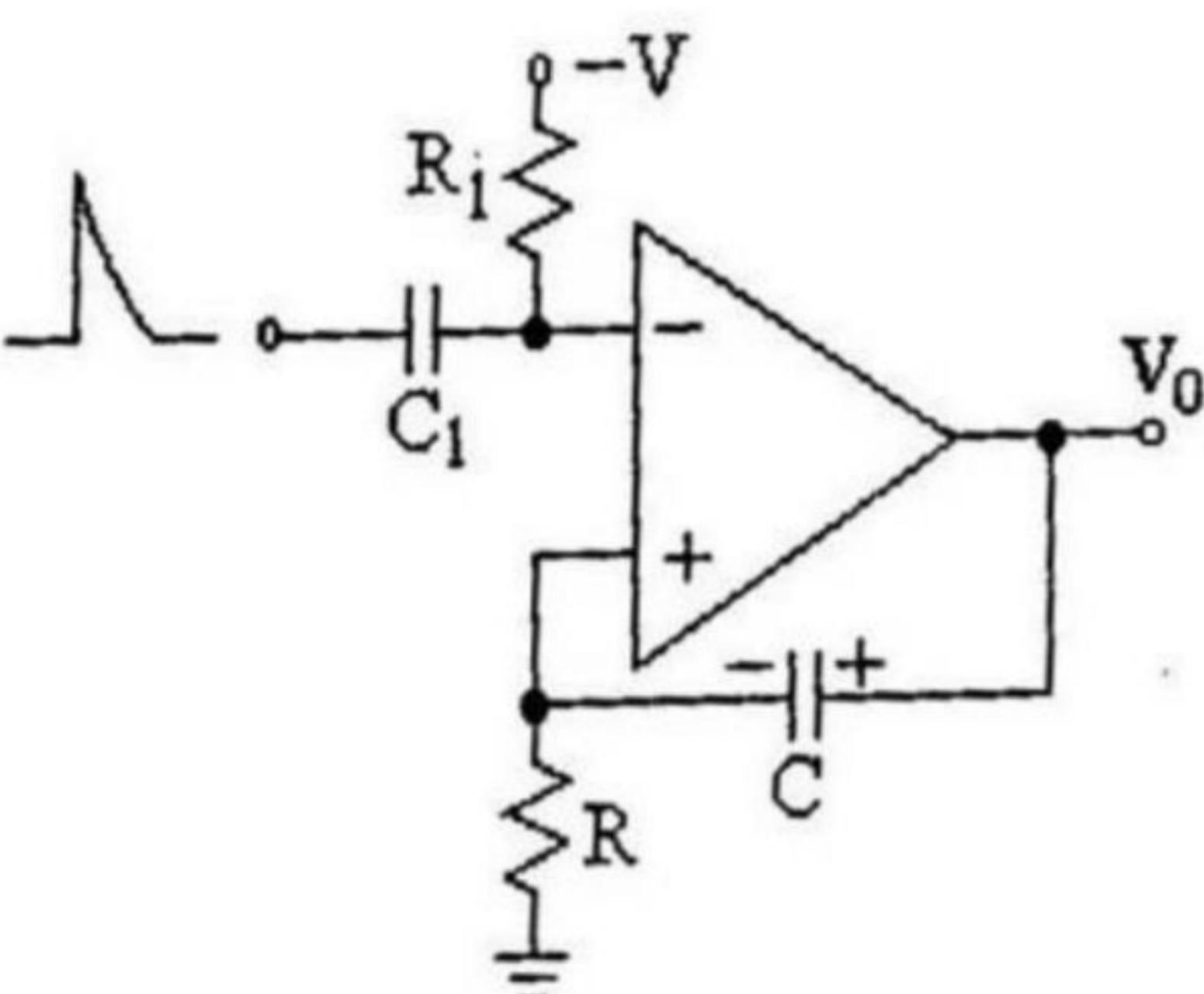


- A) 500 KHz
- B) 196 KHz
- C) 196 Hz
- D) 5.05 KHz

Correct answer

- B) 196 KHz

The stable state of the circuit is ---- 0/3



- A) positive Vsat

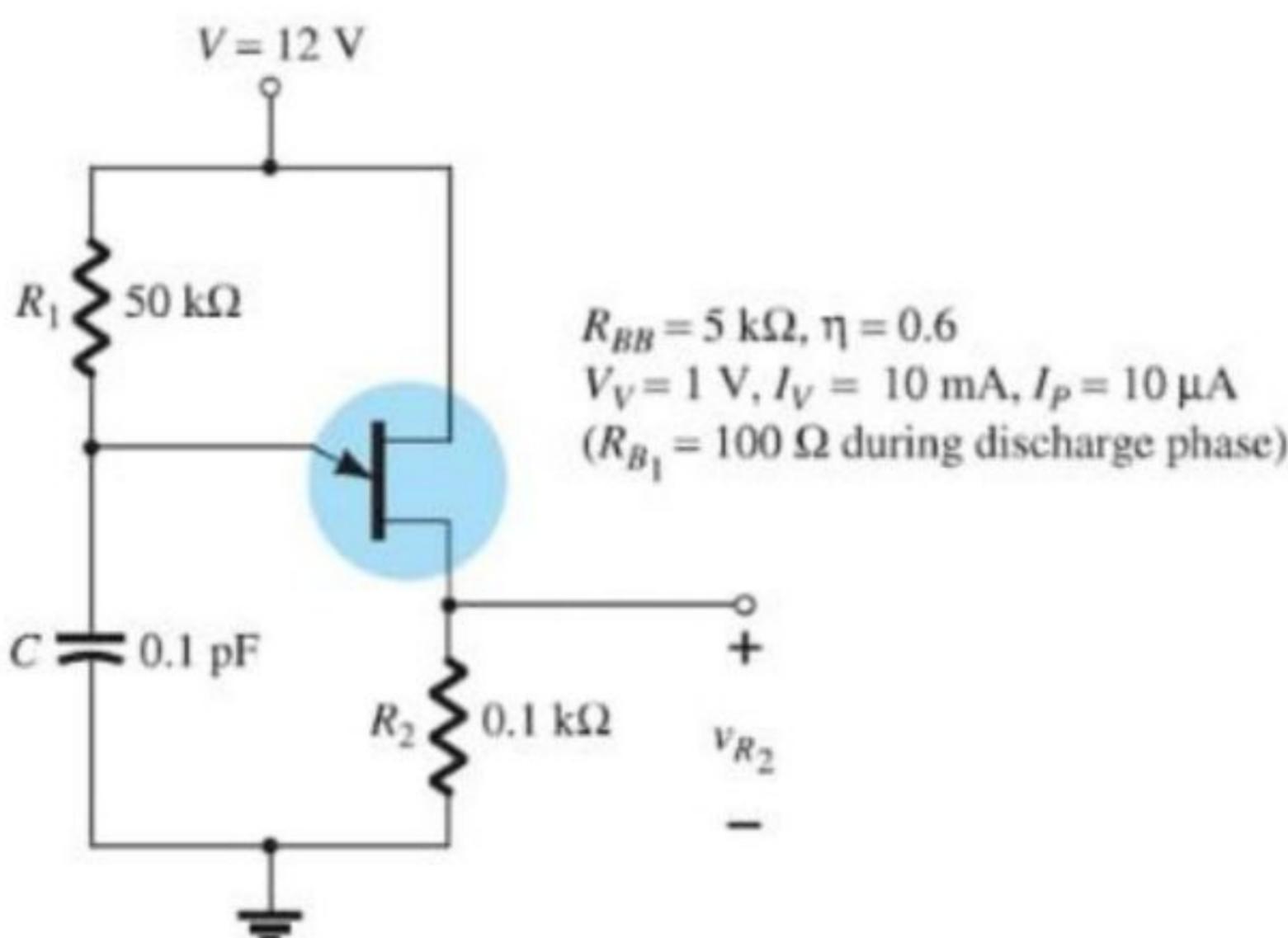


- A) positive Vsat
- B) negative Vsat
- C) equals to voltage across C1
- D) 0v

Correct answer

- A) positive Vsat

Given the relaxation oscillator 2/2
using UJT. Find the peak voltage
necessary to turn on the UJT at the
emitter current=0, use the
information beside the circuit.

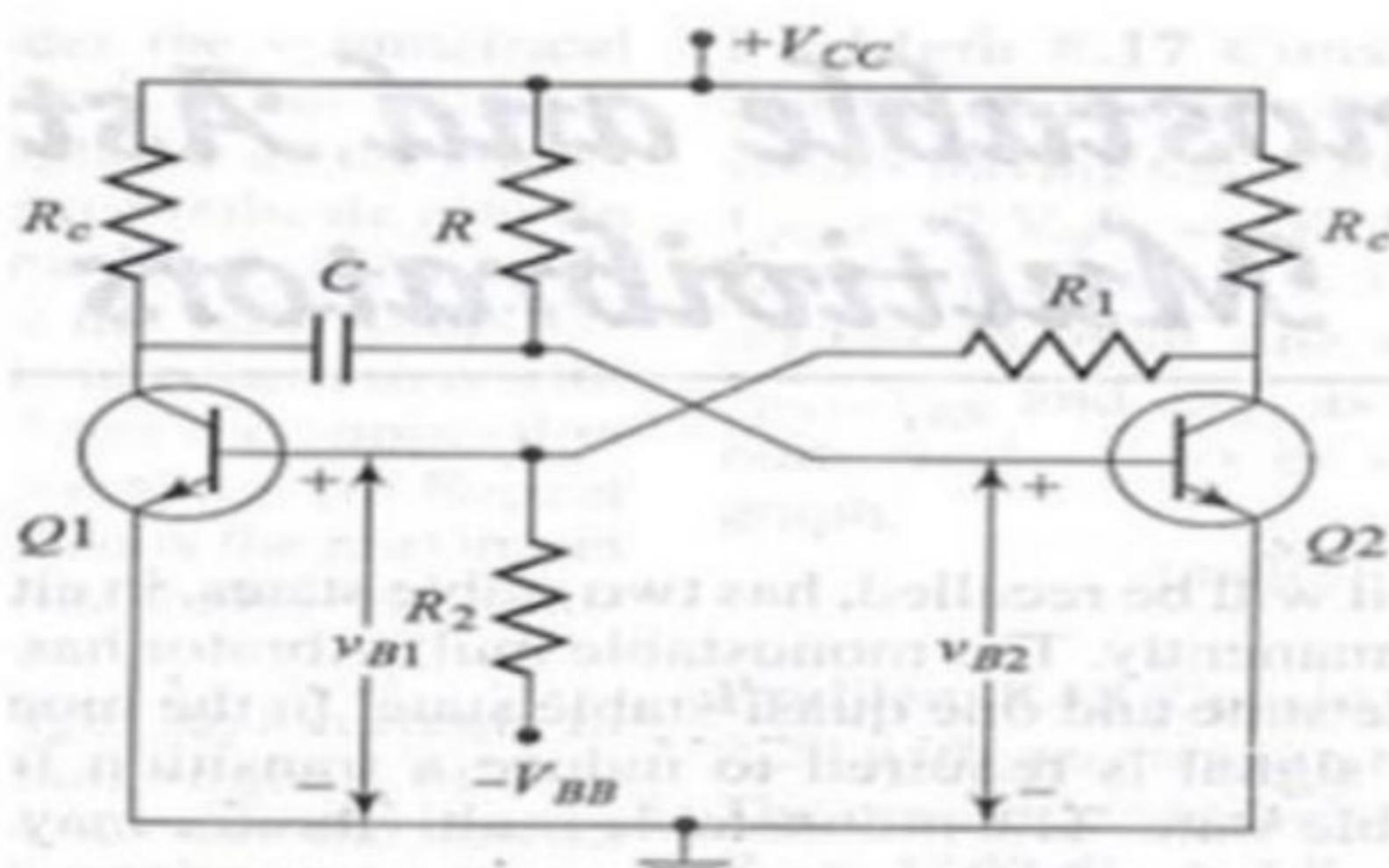


- A) 5v
- B) 7v
- C) 8v
- D) 5.5v

Feedback

C) 8v

After applying +ve trigger pulse at 0/2 the base of Q1, the capacitor will take charge through the resistor ---



A) R_C

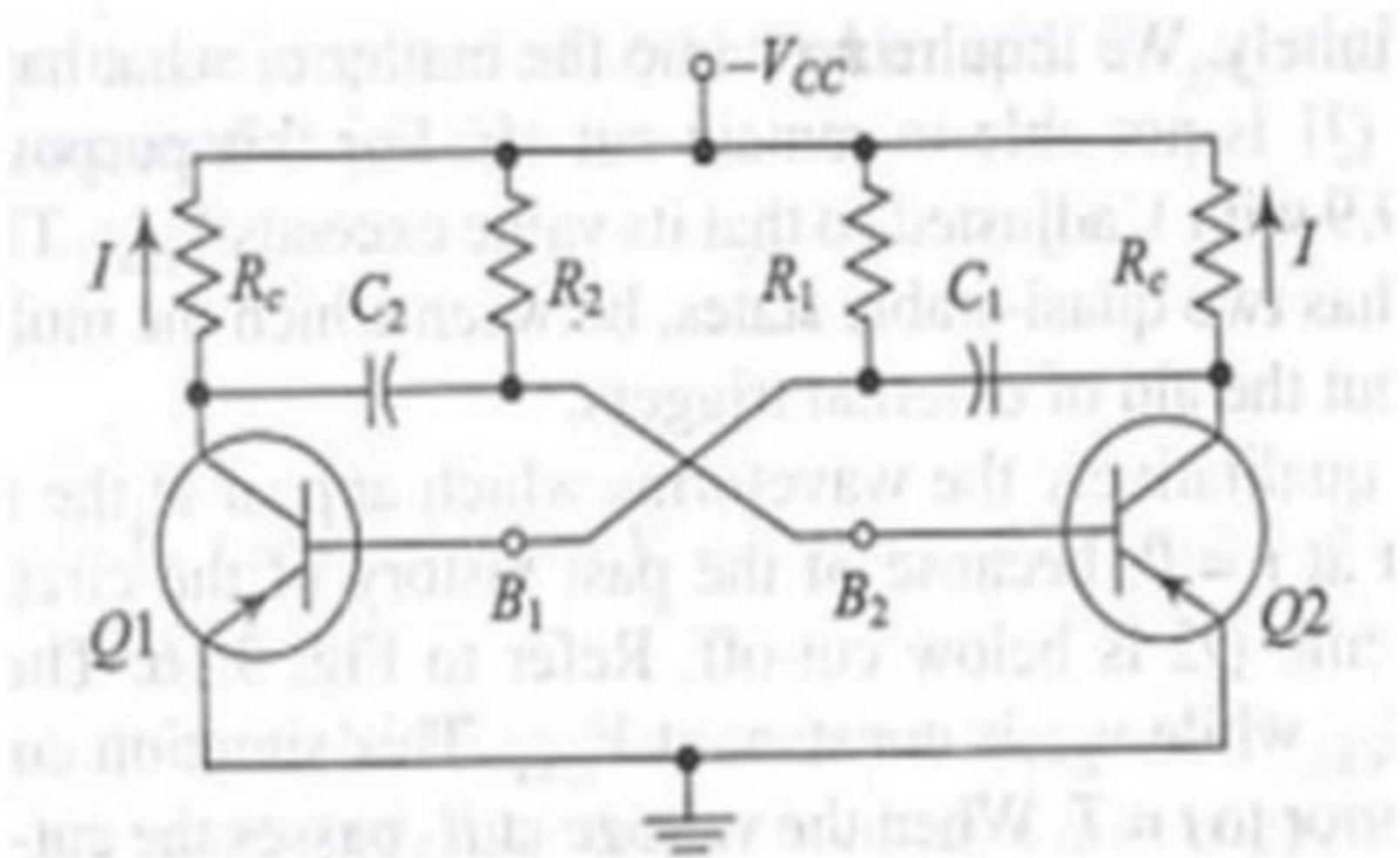
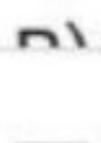


A) R_c B) R_1 C) R D) R_2

Correct answer

 C) R

The ON time for the transistor Q2 0/2
of the following circuit can
approximately be found by the
equation -----.

 A) $Q2 \text{ ON time} = 0.69R_1C_1$ 

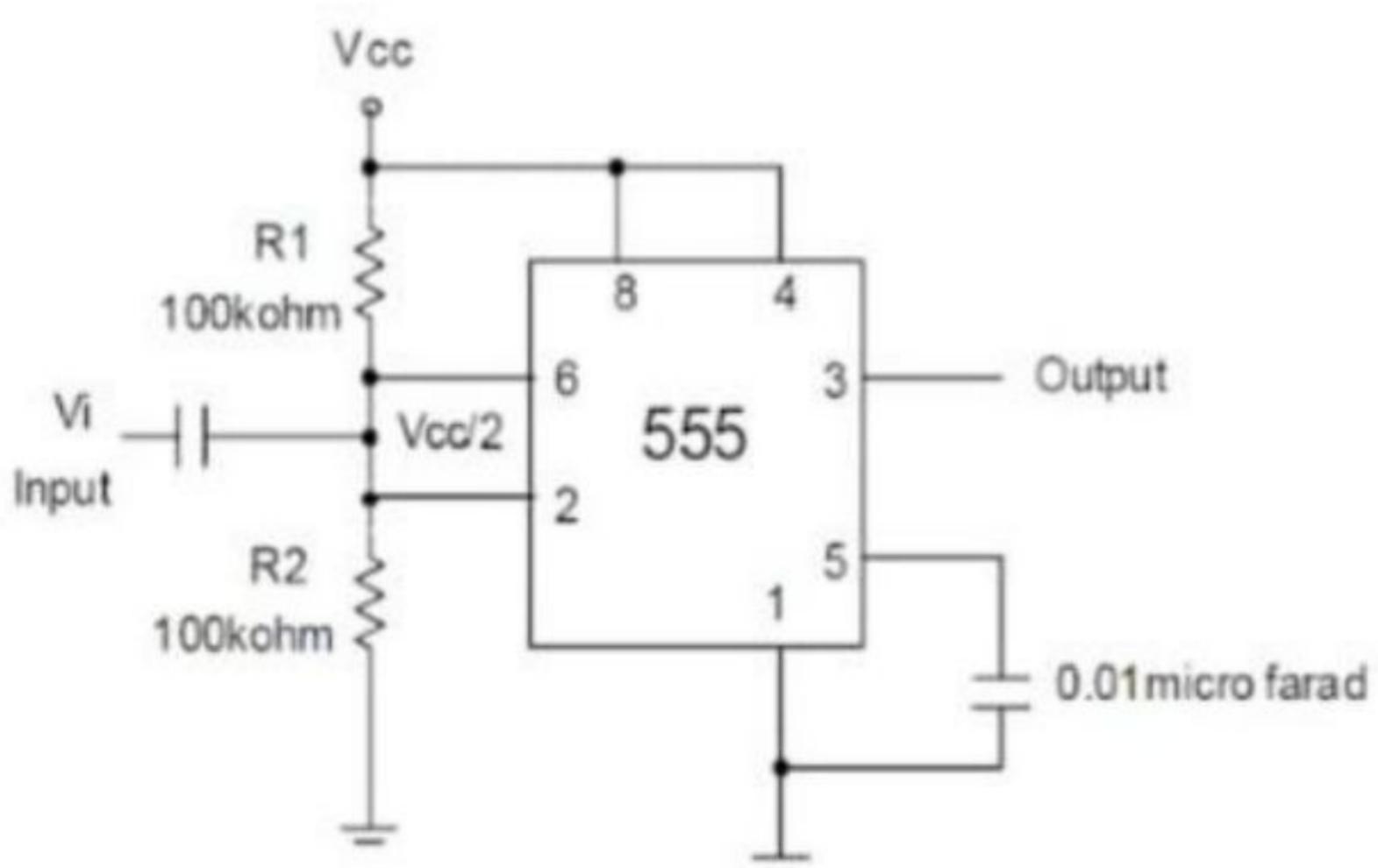


- A) Q2 ON time = $0.69R1C1$
- B) Q2 ON time = $0.69R2C2$
- C) Q2 ON time = $1.38R1C1$
- D) Q2 ON time = $0.69(R1C1+R2C2)$

Correct answer

- A) Q2 ON time = $0.69R1C1$

The following circuit is an example 2/2
of -----



- A) Astable multivibrator

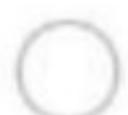
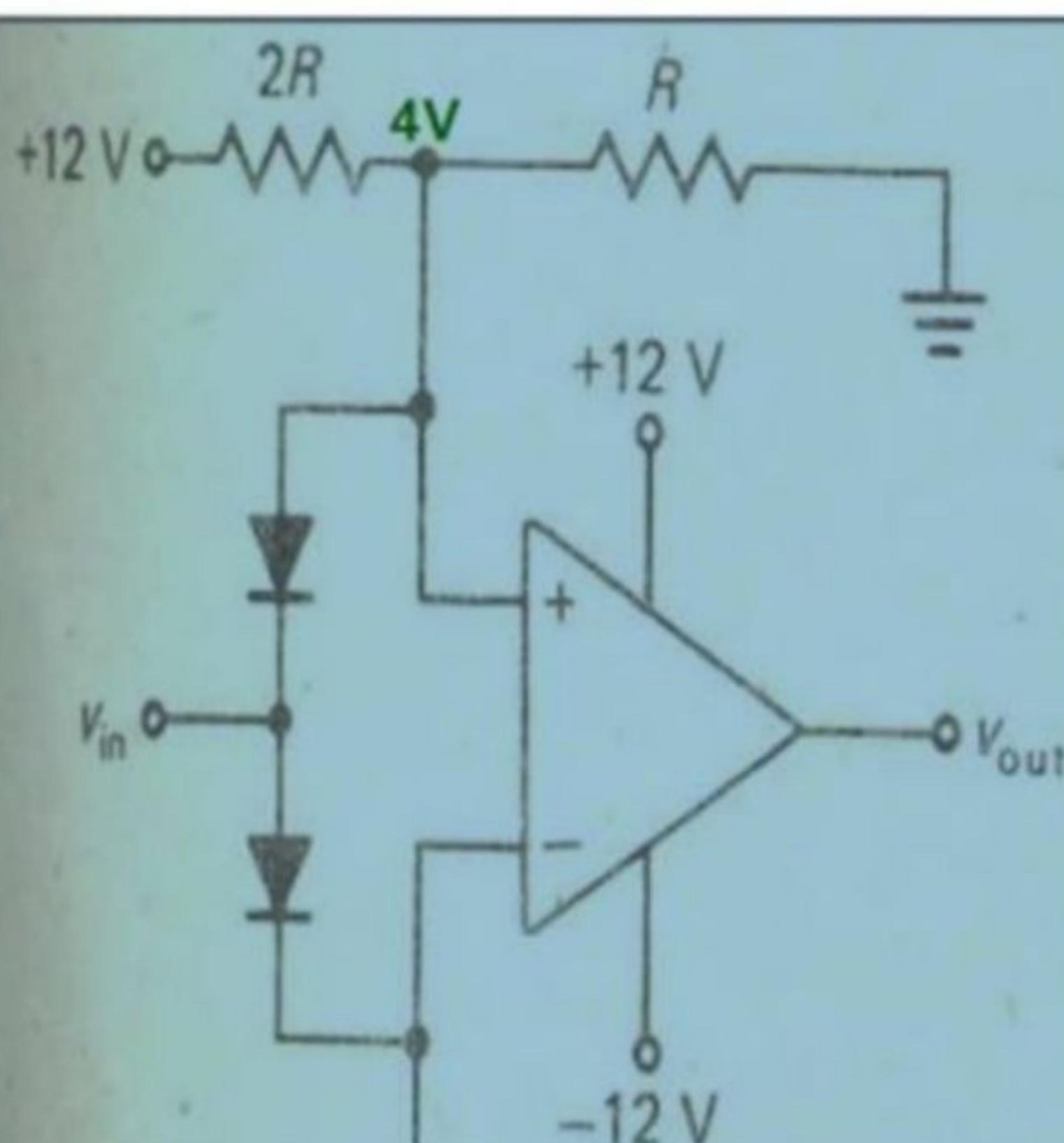


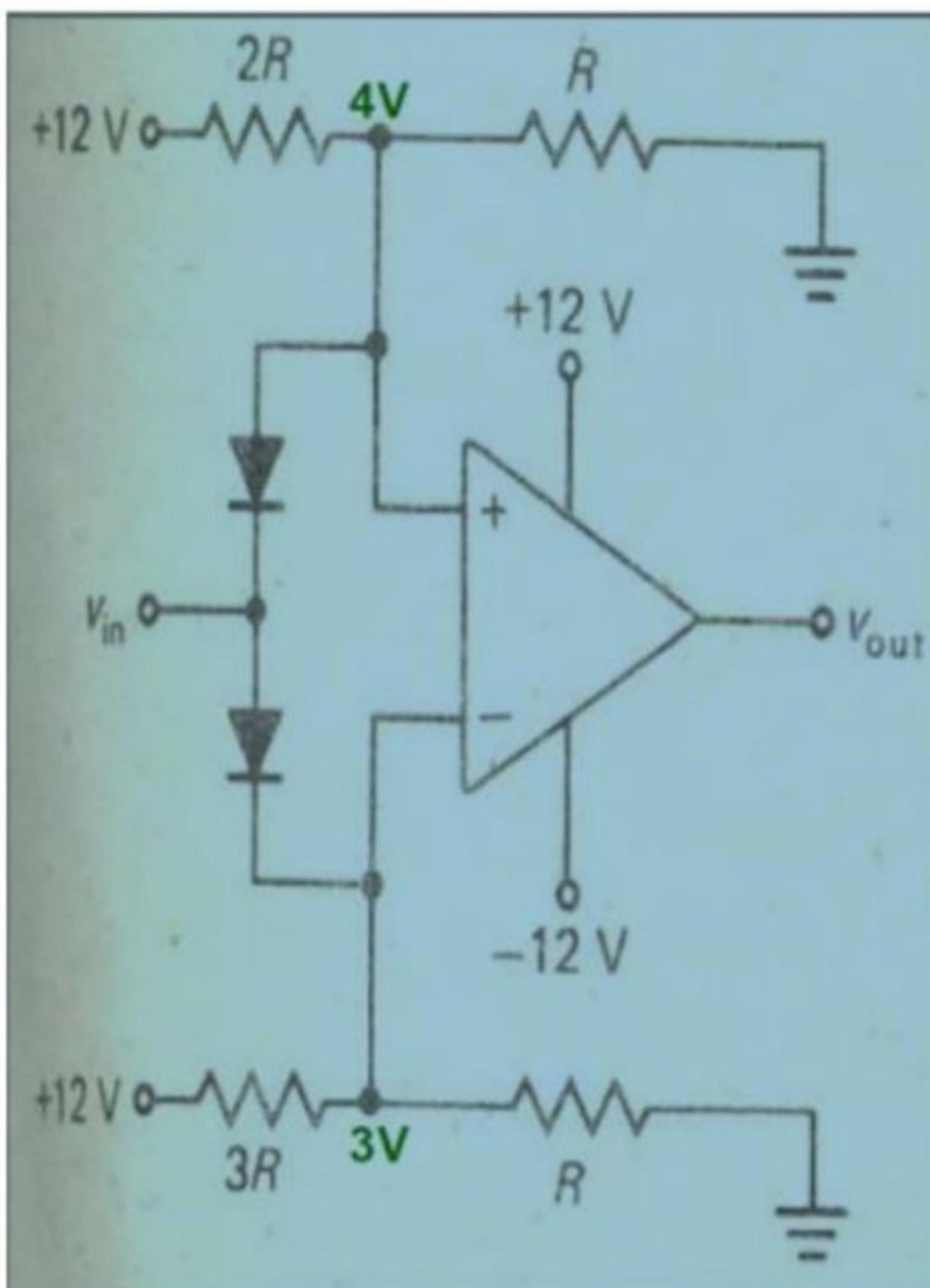
- B) Bistable multivibrator
- C) Monostable multivibrator
- D) Schmitt Trigger using 555 IC

Feedback

D) Schmitt Trigger using 555 IC

The LTP and UTP of the circuit are - 2/2





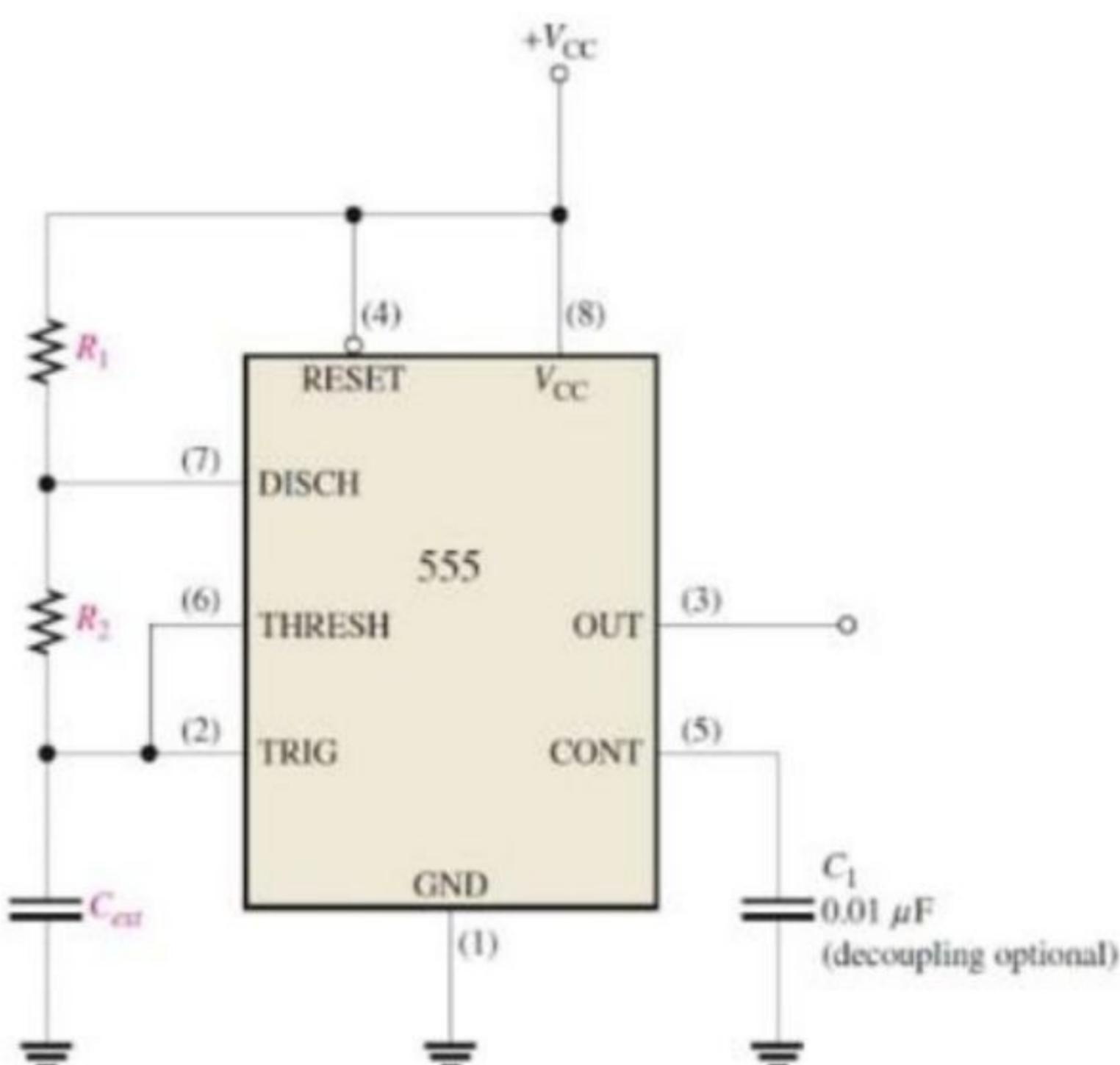
- A) 3V and 4V
- B) 3.7V and 4.7V
- C) 2.3V and 4.7V

Feedback

C) 2.3V and 4.7V



If the external resistors $R_1=R_2=5K$ Ohms, capacitor $C=10$ micro Farad, the duty cycle of the output at pin 3 will be -----



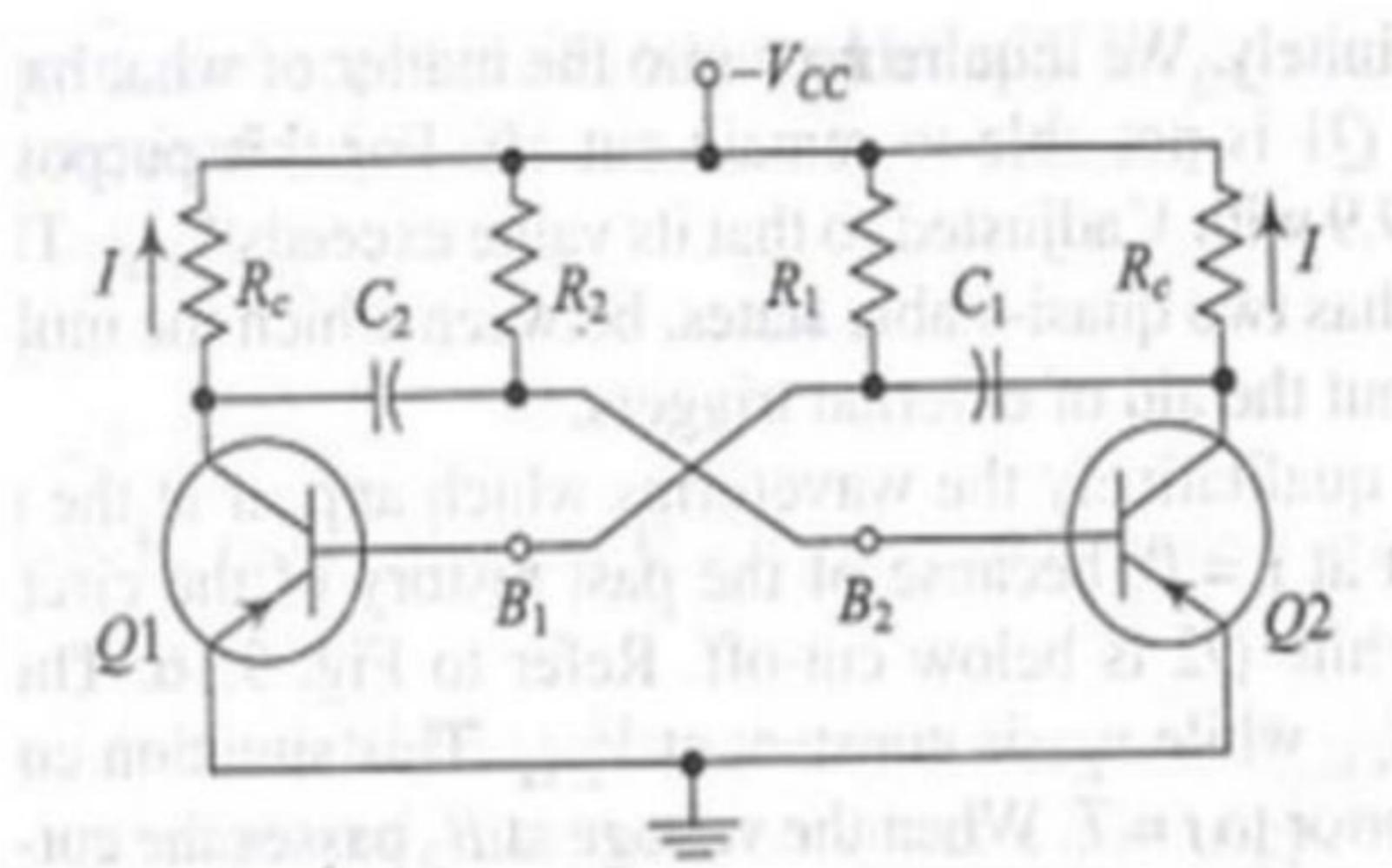
- A) 50%
- B) 33.33%
- C) 66.66%
- D) 60%

Feedback

C) 66.66%



The following circuit is an example 1/1
of -----.



- A) Bistable multivibrator
- B) Astable multivibrator
- C) Monostable multivibrator
- D) Schmitt trigger

Feedback

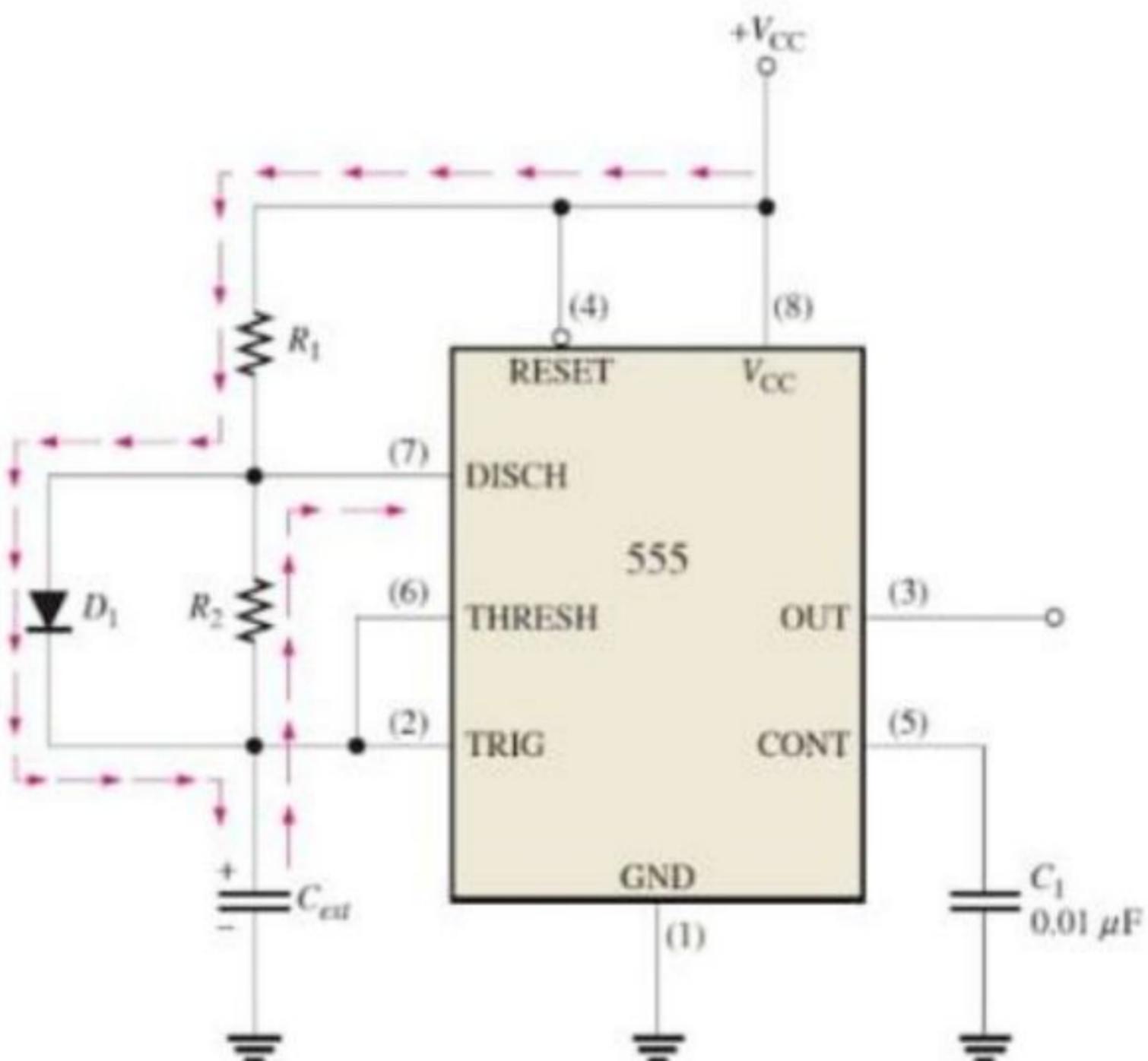
B) Astable multivibrator

If the external resistor $R_1=R_2=1\text{K}\Omega$ Ohms, capacitor $C=1\text{ micro Farad}$,



If the external resistor $R_1=R_2=1\text{K}$ 0/2

Ohms, capacitor $C=1\text{ micro Farad}$,
the output frequency at pin 3 will
be -----



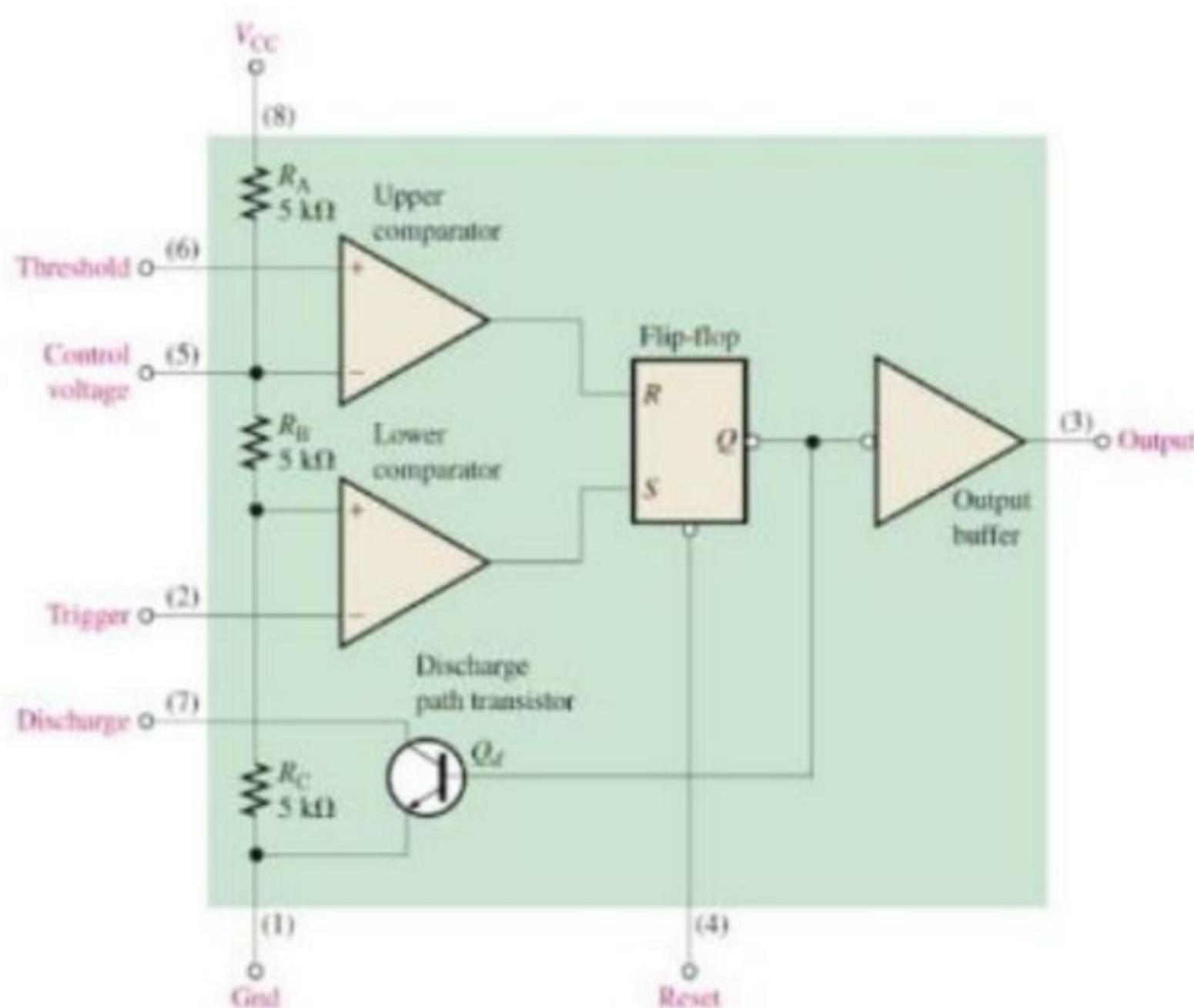
- A) 1.440KHz
- B) 720 Hz
- C) 1KHz
- D) 1MHz

Correct answer

- B) 720 Hz



For the following circuit, if $V_{CC} = 12\text{v}$, the LTP and UTP will be as follows -



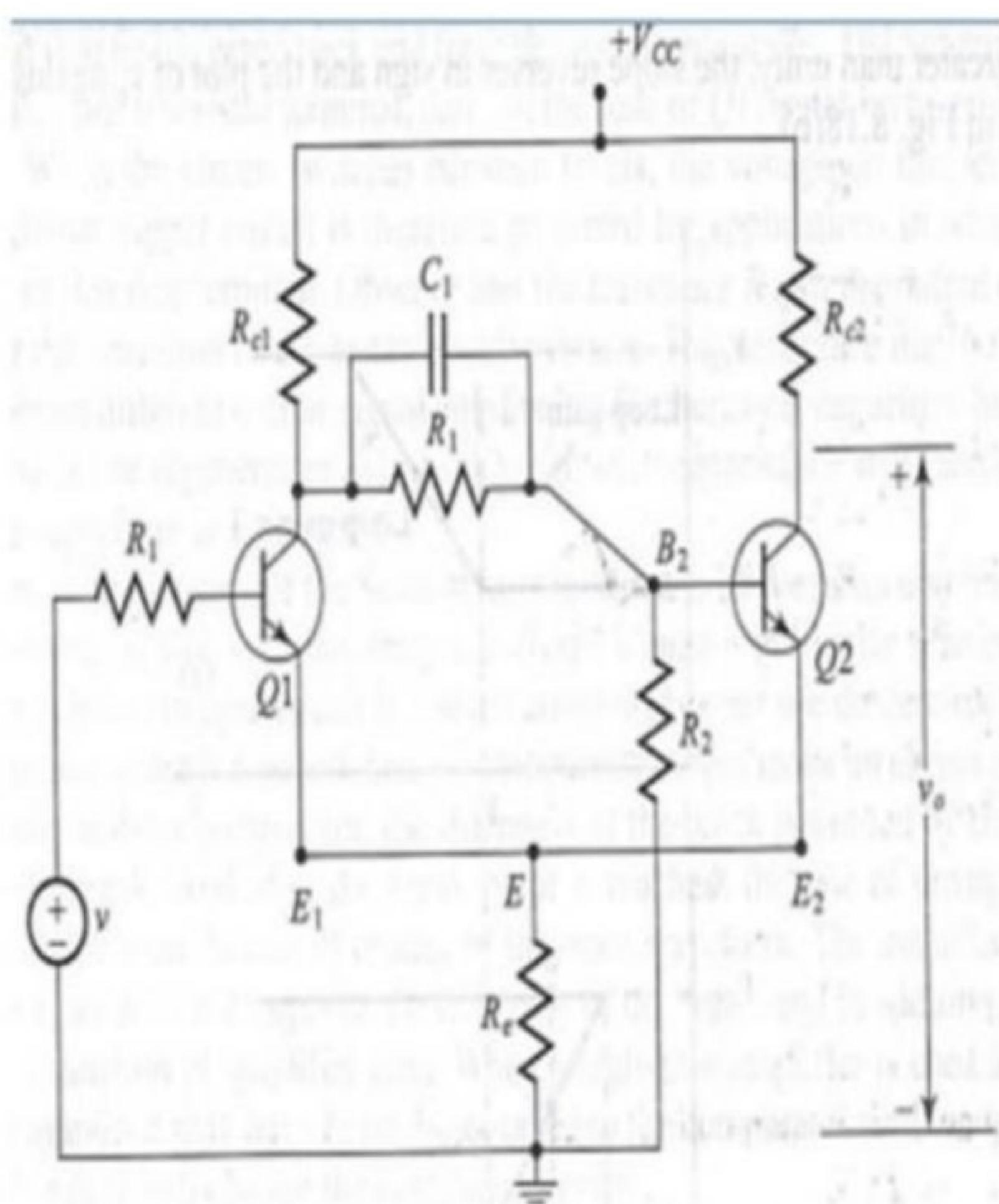
- A) 4v and 7v
- B) 3v and 8v
- C) 4v and 8v
- D) 4v and 12v

Feedback

C) 4v and 8v



At the input voltage below the LTP 2/2 of the circuit, the base voltage of Q2 becomes ----- its emitter voltage at E2



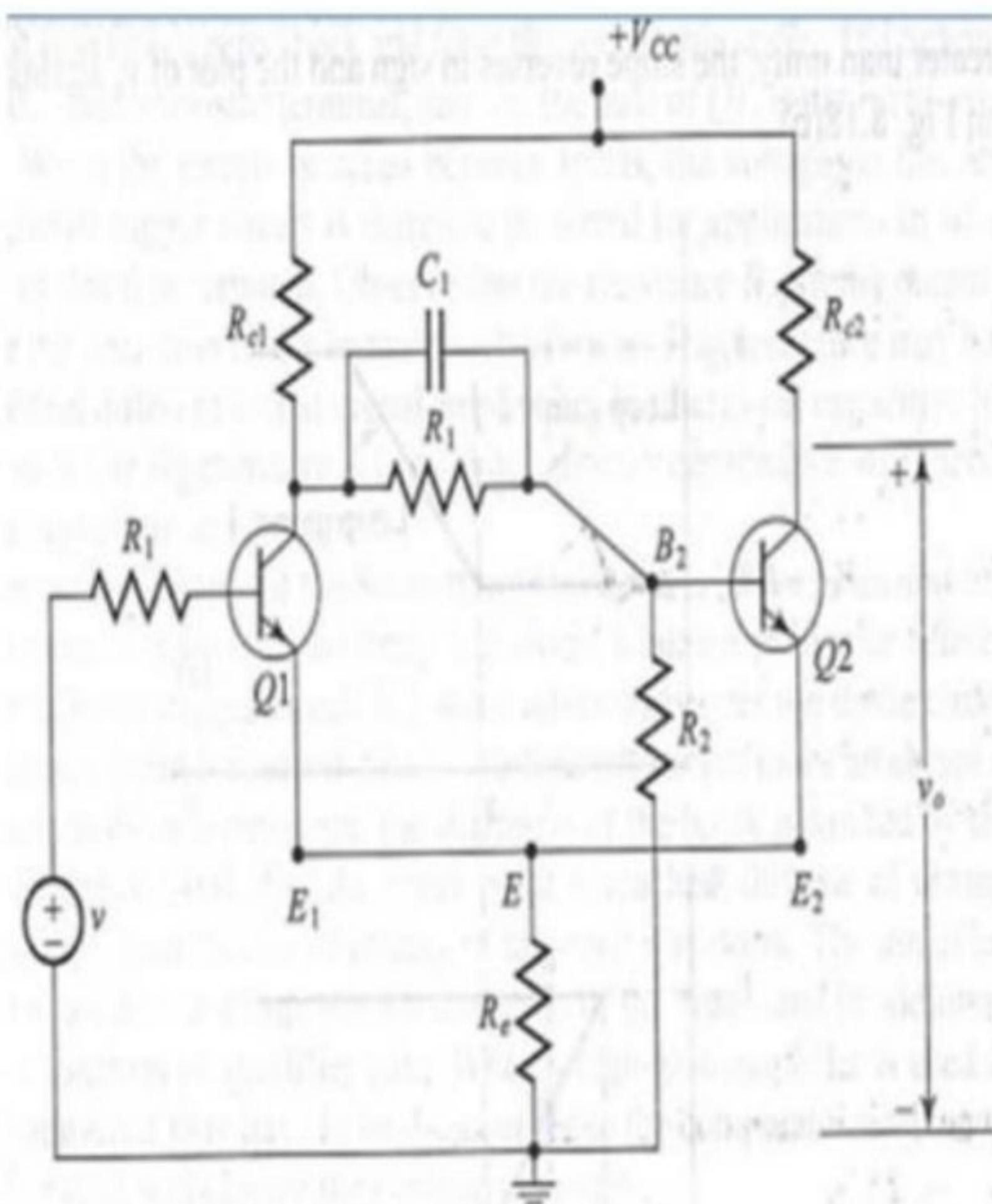
- A) lower than
 - B) equals to
 - C) higher than



Feedback



voltage at E2



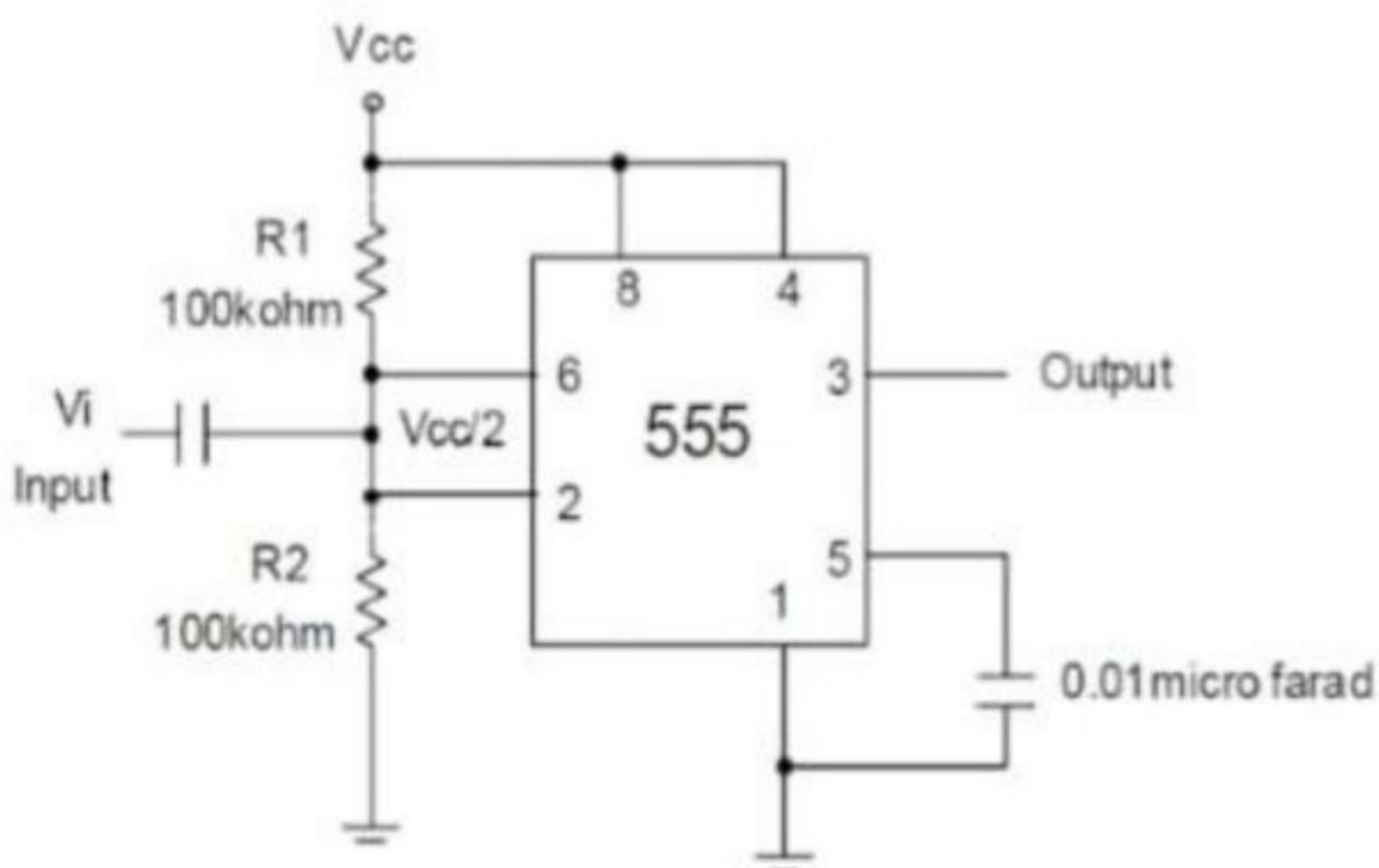
- A) lower than
 - B) equals to
 - C) higher than

Feedback

c) higher than



If the input voltage becomes greater than two-thirds of the Vcc, the output becomes -----.



- A) equals to +Vsat
- B) equals to input voltage
- C) equals to -Vsat

Correct answer

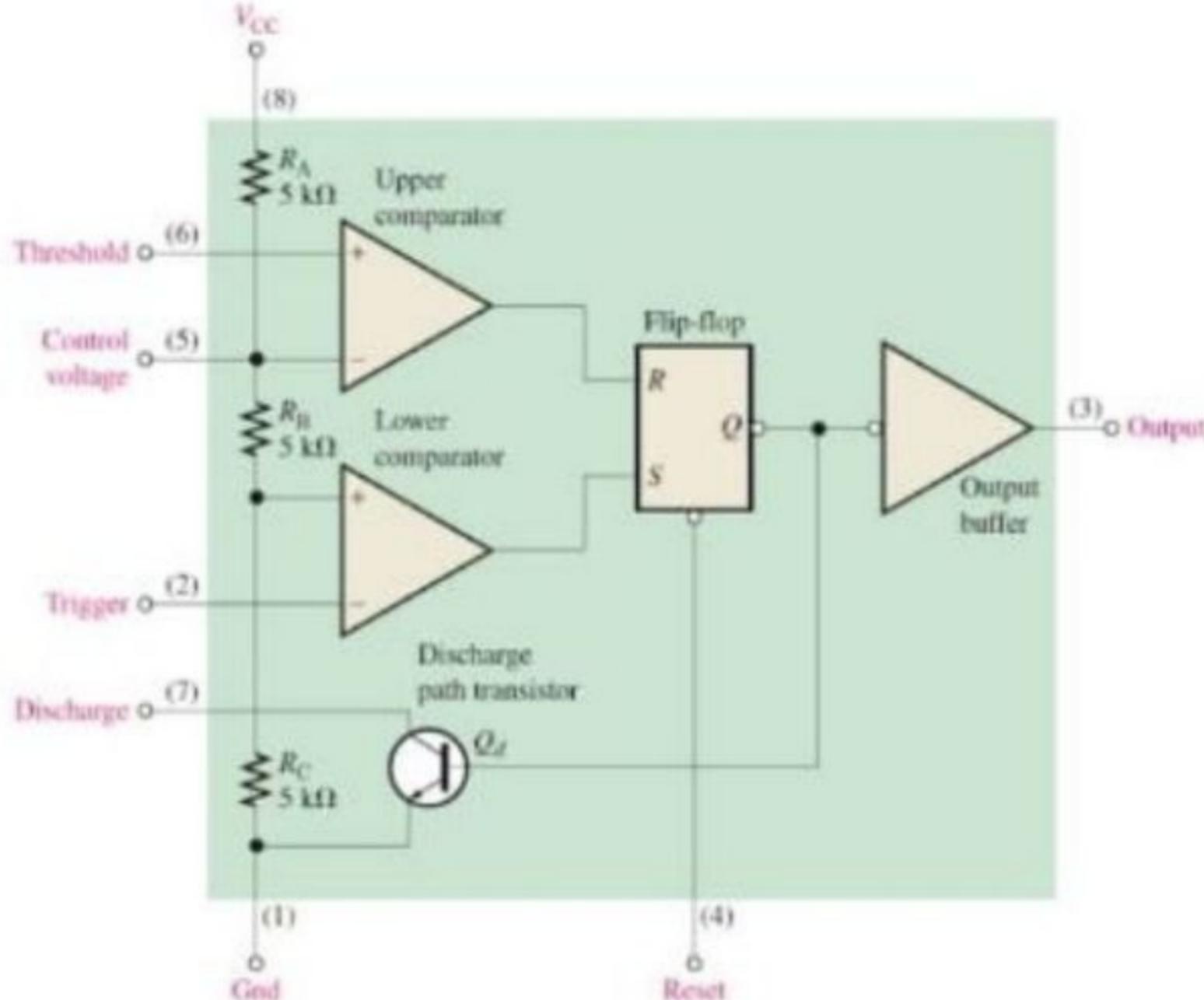
- C) equals to -Vsat

For the following circuit, if $Vcc=12v$, 3/3 the LTP and UTP will be as follows -





For the following circuit, if $V_{CC} = 12\text{v}$, the LTP and UTP will be as follows -



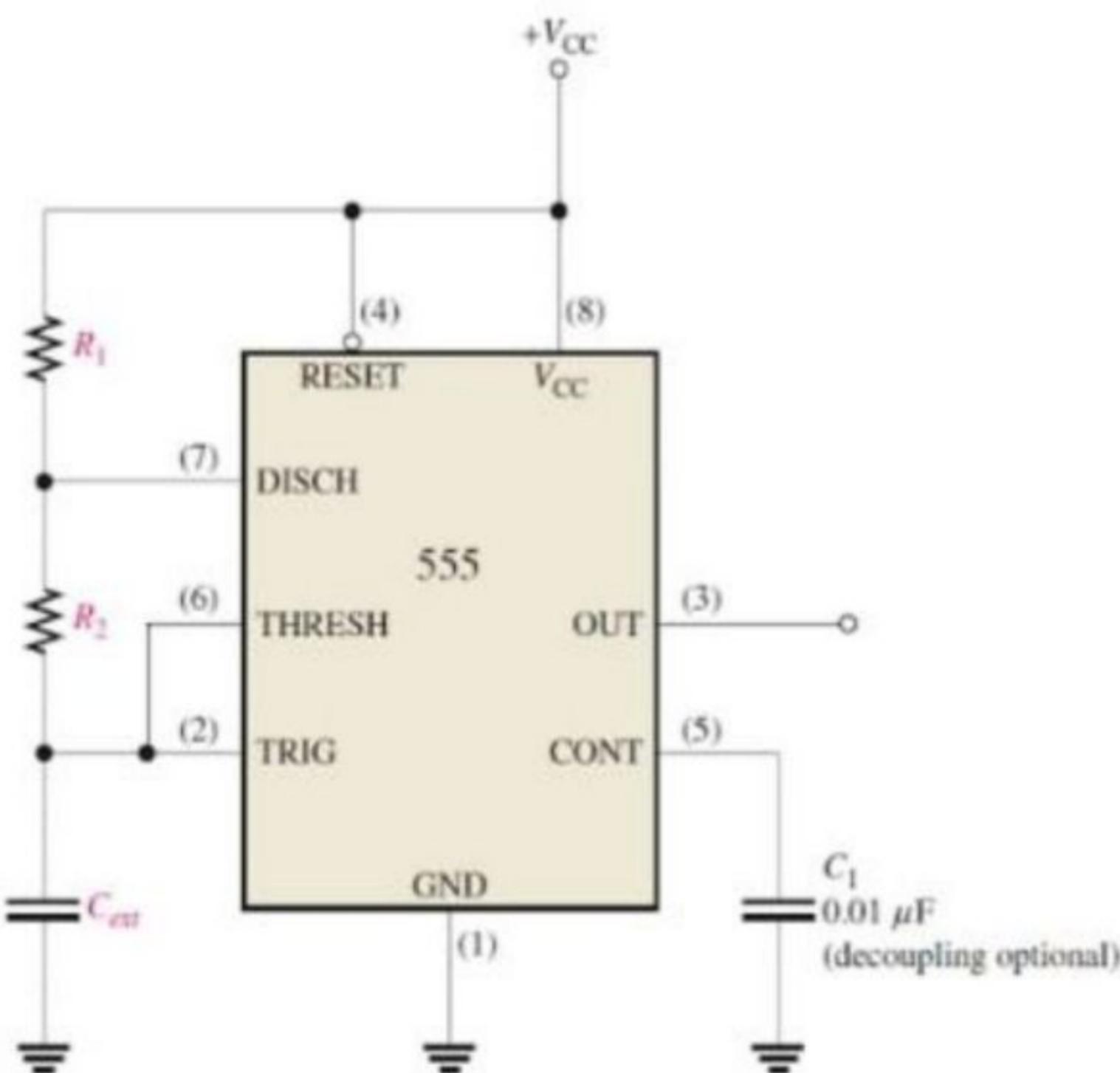
- A) 4v and 7v
- B) 3v and 8v
- C) 4v and 8v
- D) 4v and 12v

Feedback

C) 4v and 8v



If the capacitor voltage starts from 0/3
4v and ends at 8v with the target
voltage 12v, $RC = \text{time}$
 $\text{constant} = 1\text{ms}$. Find the charging
time $t = \text{----- ms}$



- A) 5 ms
- B) 0.5 ms
- C) 1 ms
- D) 0.693 ms

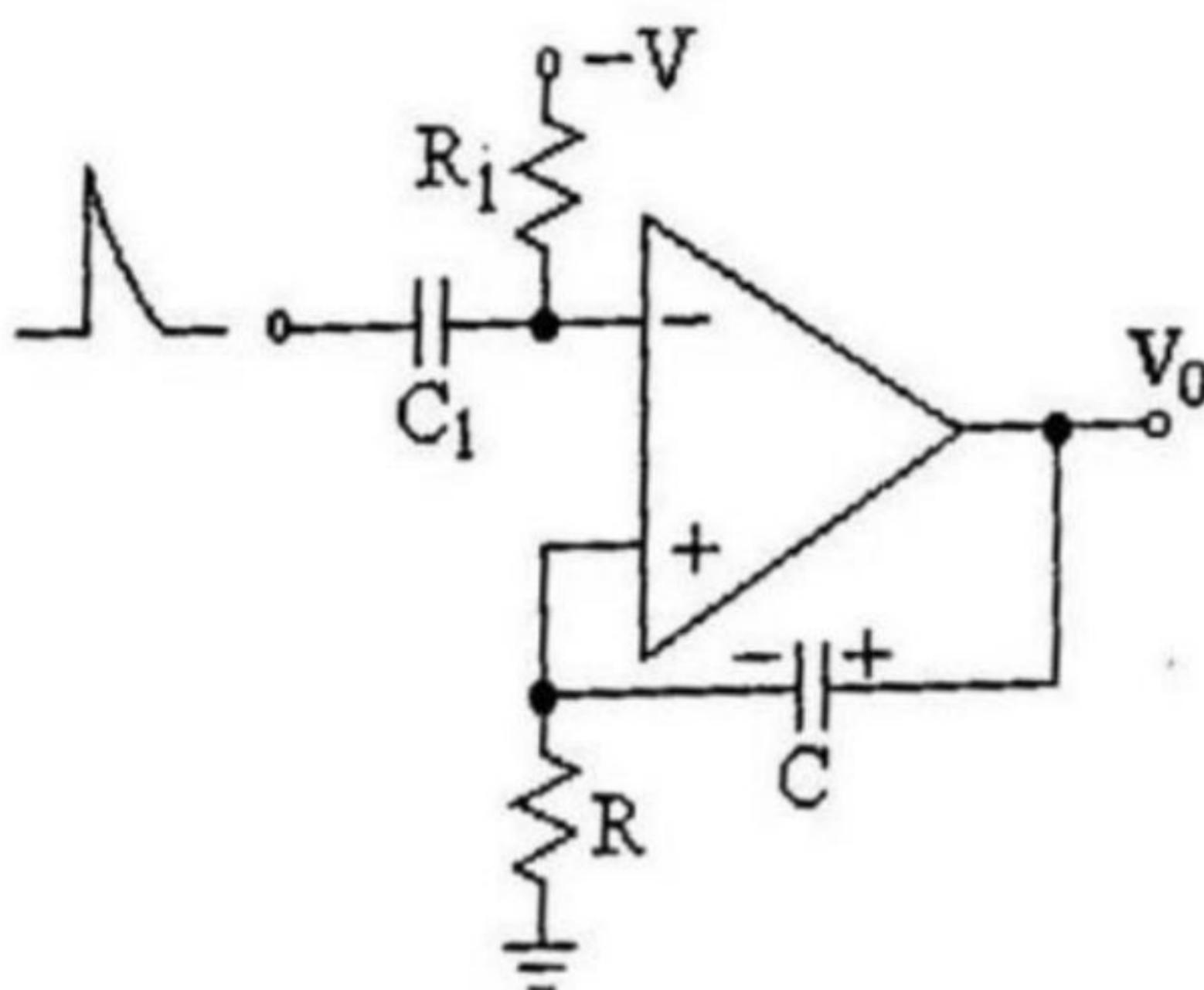
Correct answer



- D) 0.693 ms



The stable state of the circuit is ---- 0/3



- A) positive Vsat
- B) negative Vsat
- C) equals to voltage across C_1
- D) 0v

Correct answer

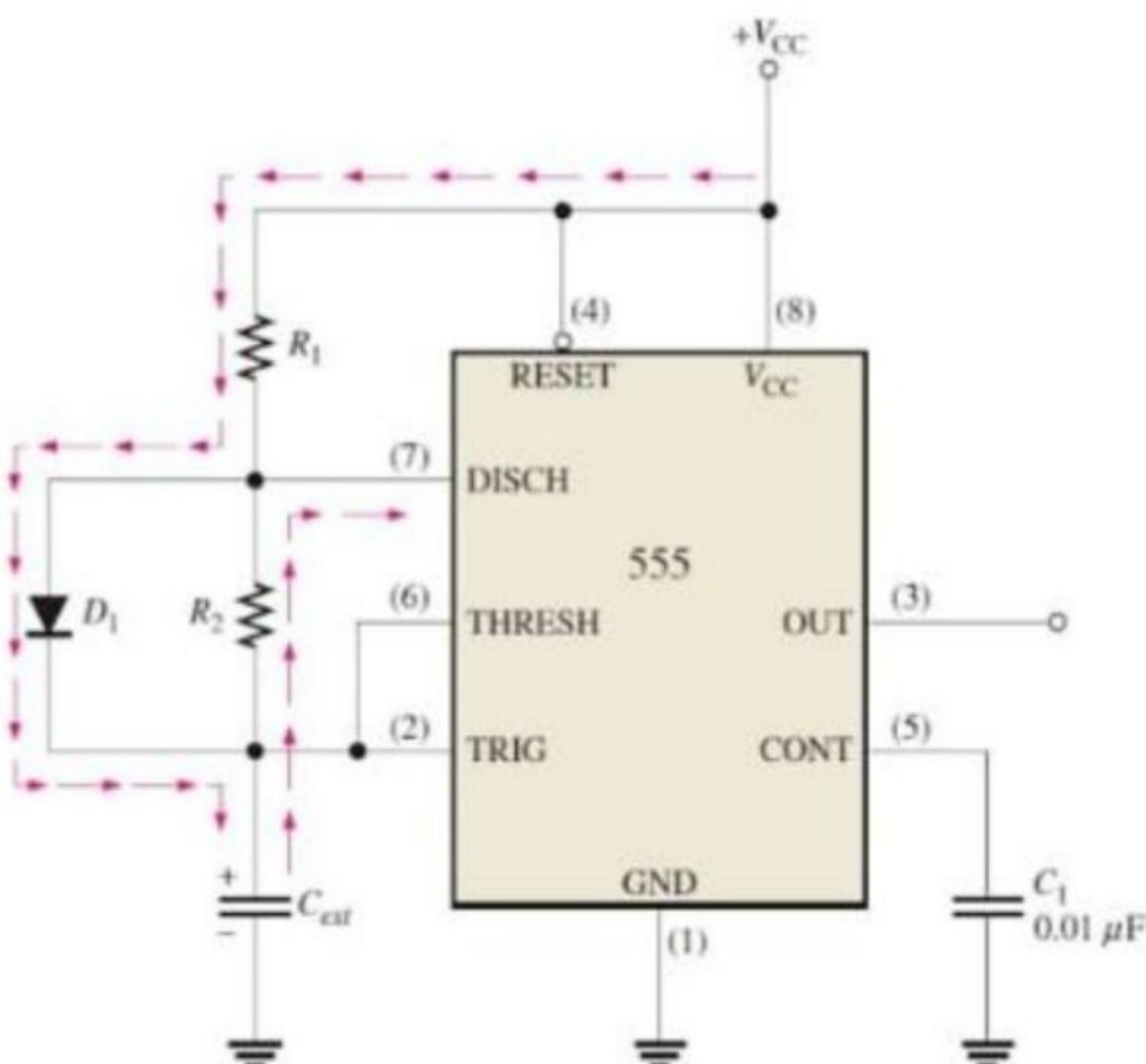
- A) positive Vsat



If we consider the diode D is ideal, 3/3
the duty cycle of the output



If we consider the diode D₁ is ideal,
the duty cycle of the output
waveform will be -----



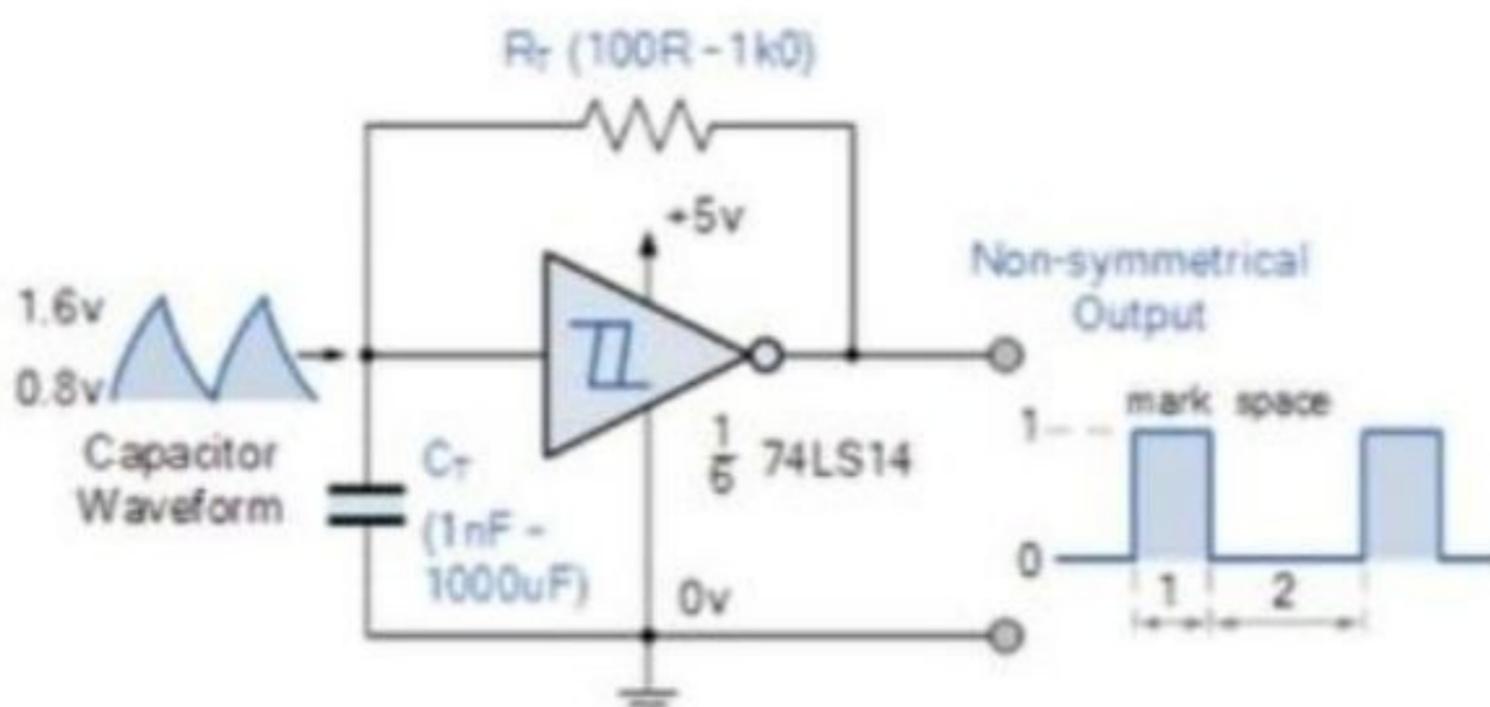
- A) 50%
- B) 33.33%
- C) 66.66%
- D) 60%

Feedback

A) 50%



The inverter used here is -----.



- A) Schmitt Trigger
- B) inverter using Open collector output
- C) inverter using TTL
- D) inverter using OP-Amp

Feedback

A) Schmitt Trigger

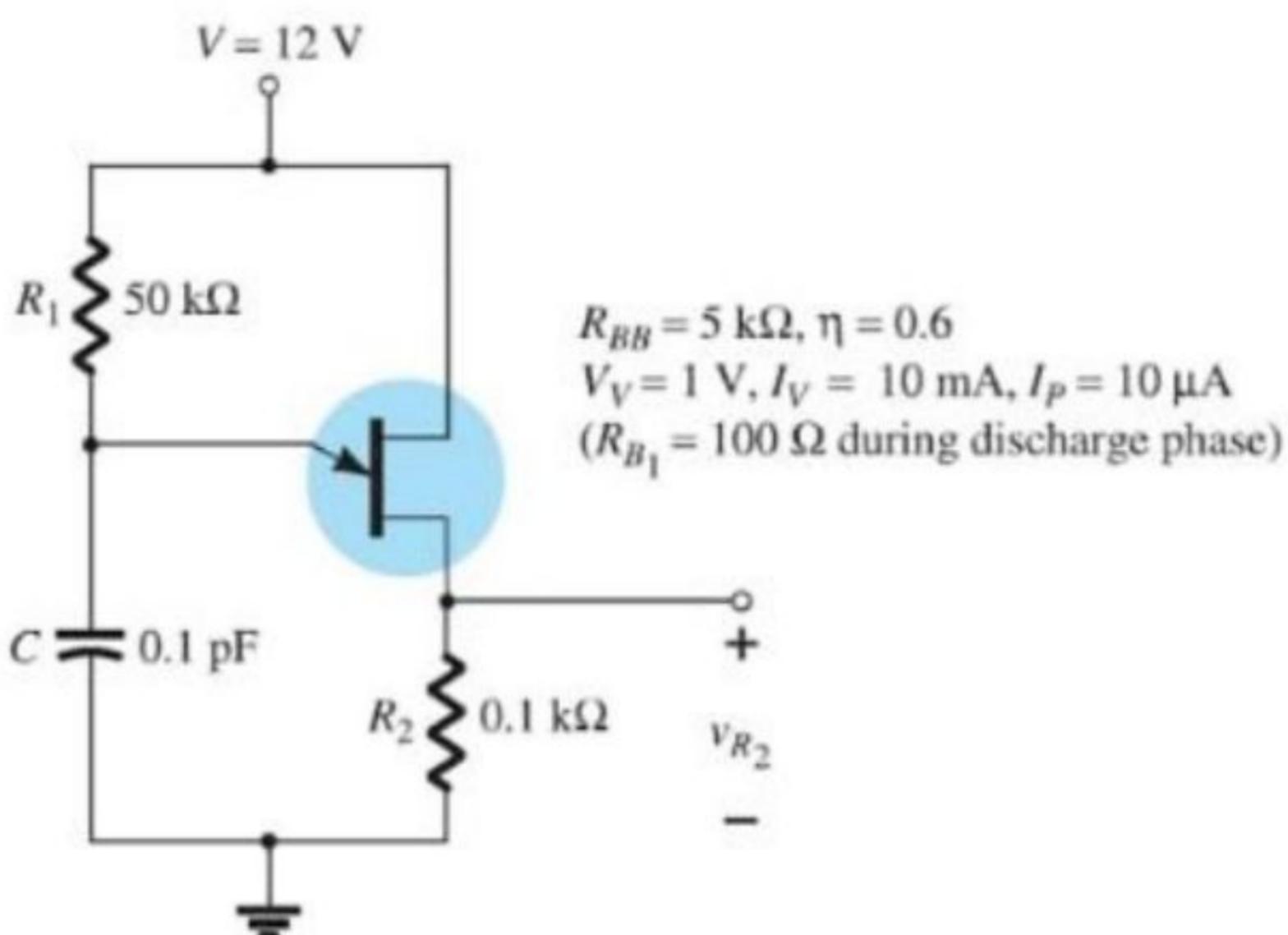
Given the relaxation oscillator 2/2

using UJT. Find the frequency of oscillation. [use the information



Given the relaxation oscillator using UJT. Find the frequency of oscillation. [use the information beside the circuit.]

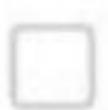
2/2



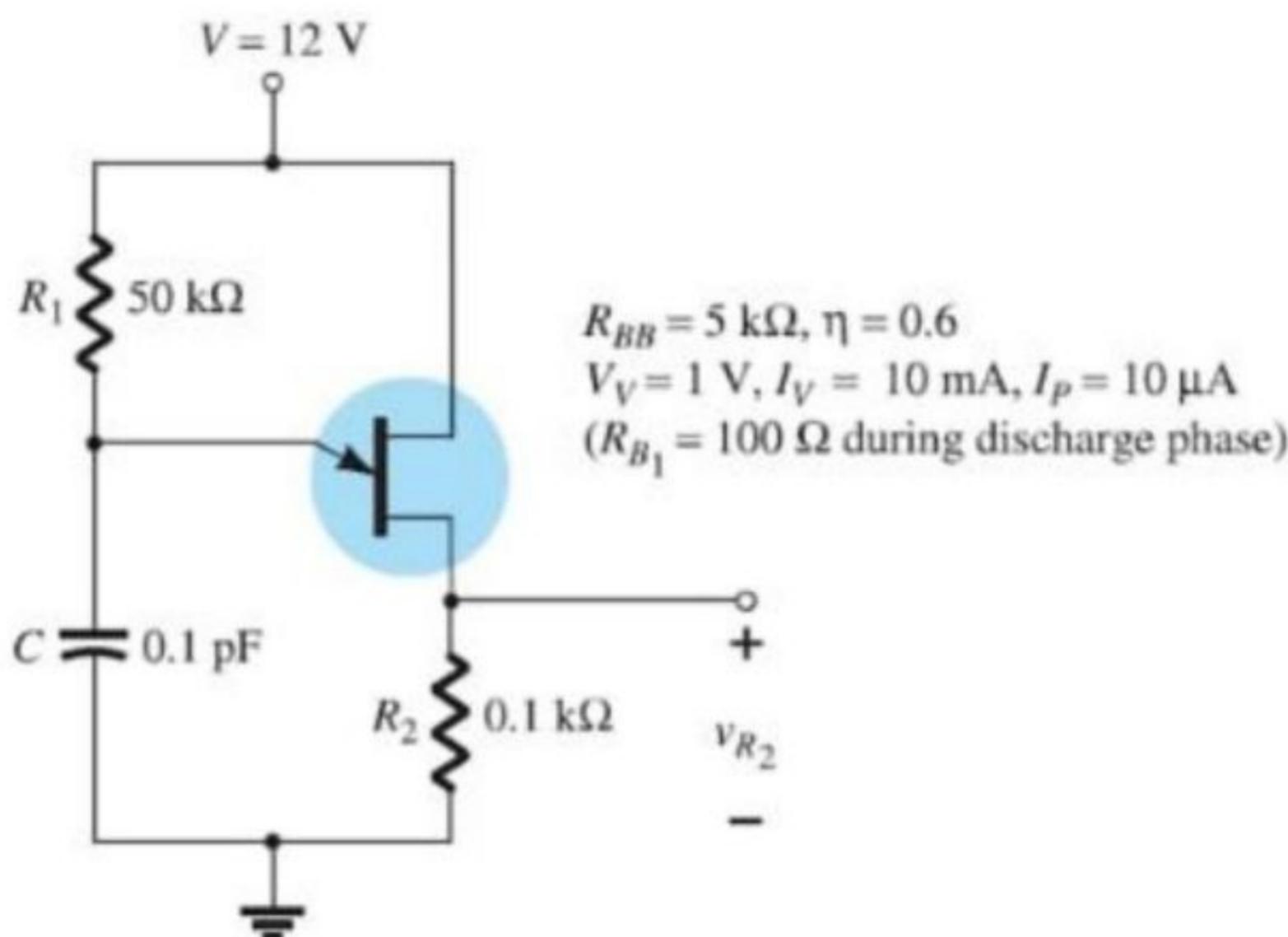
- A) 500 KHz
- B) 196 KHz
- C) 196 Hz
- D) 5.05 KHz

Feedback

B) 196 KHz



Given the relaxation oscillator 0/2
using UJT. Determine RB1 and RB2
at the emitter current=0, use the
information beside the circuit.



- A) RB1 = 2K, RB2 = 3K
- B) RB1 = 3K, RB2 = 2K
- C) RB1 = 2.5K, RB2 = 2.5K

Correct answer

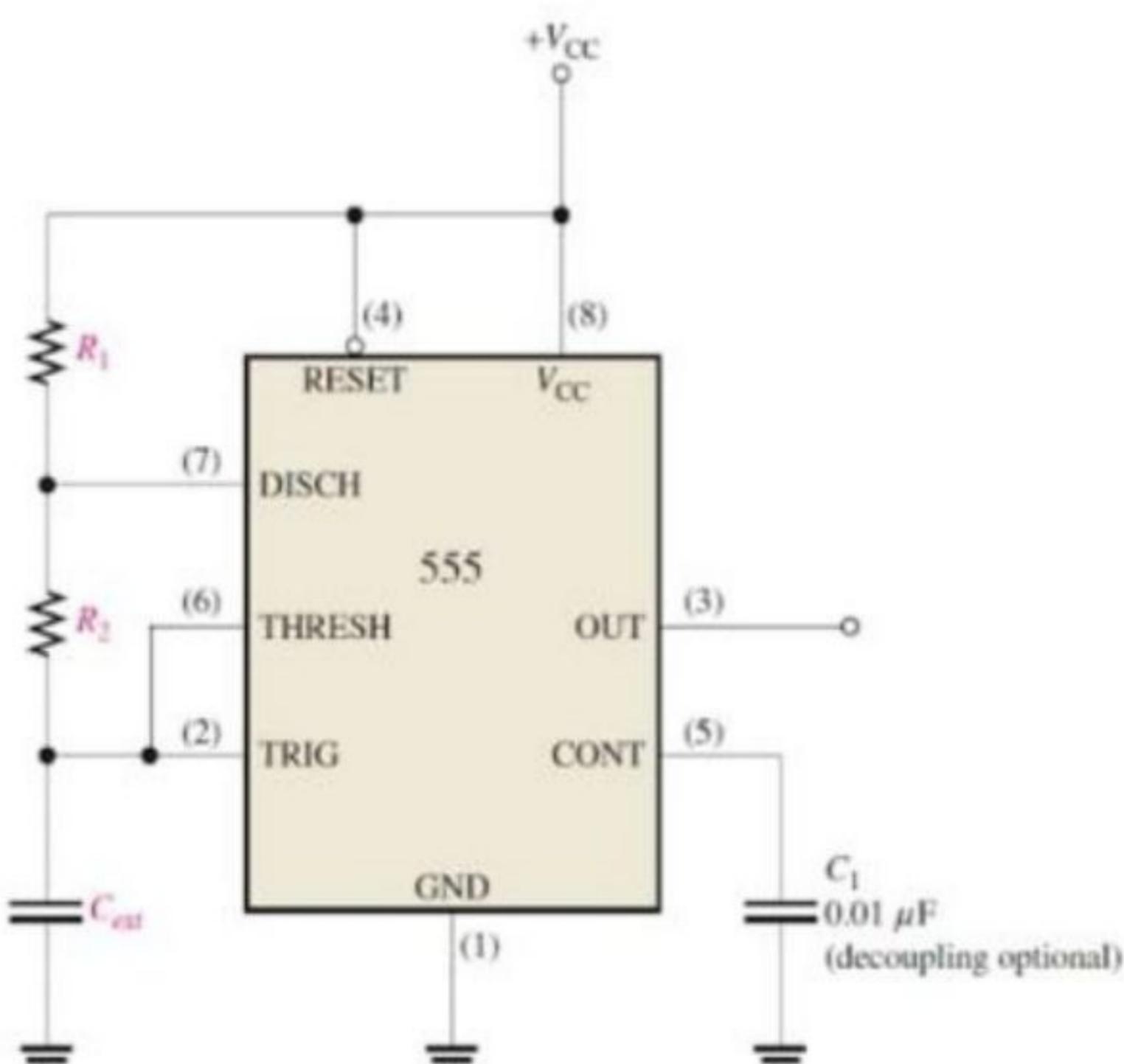
- B) RB1 = 3K, RB2 = 2K

If the external resistor 2/2
 $R_1 + 2R_2 = 1.44\text{K Ohms}$, capacitor



If the external resistor
 $R_1+2R_2=1.44\text{K}$ Ohms, capacitor
 $C=1$ micro Farad, the output
frequency at pin 3 will be -----

2/2



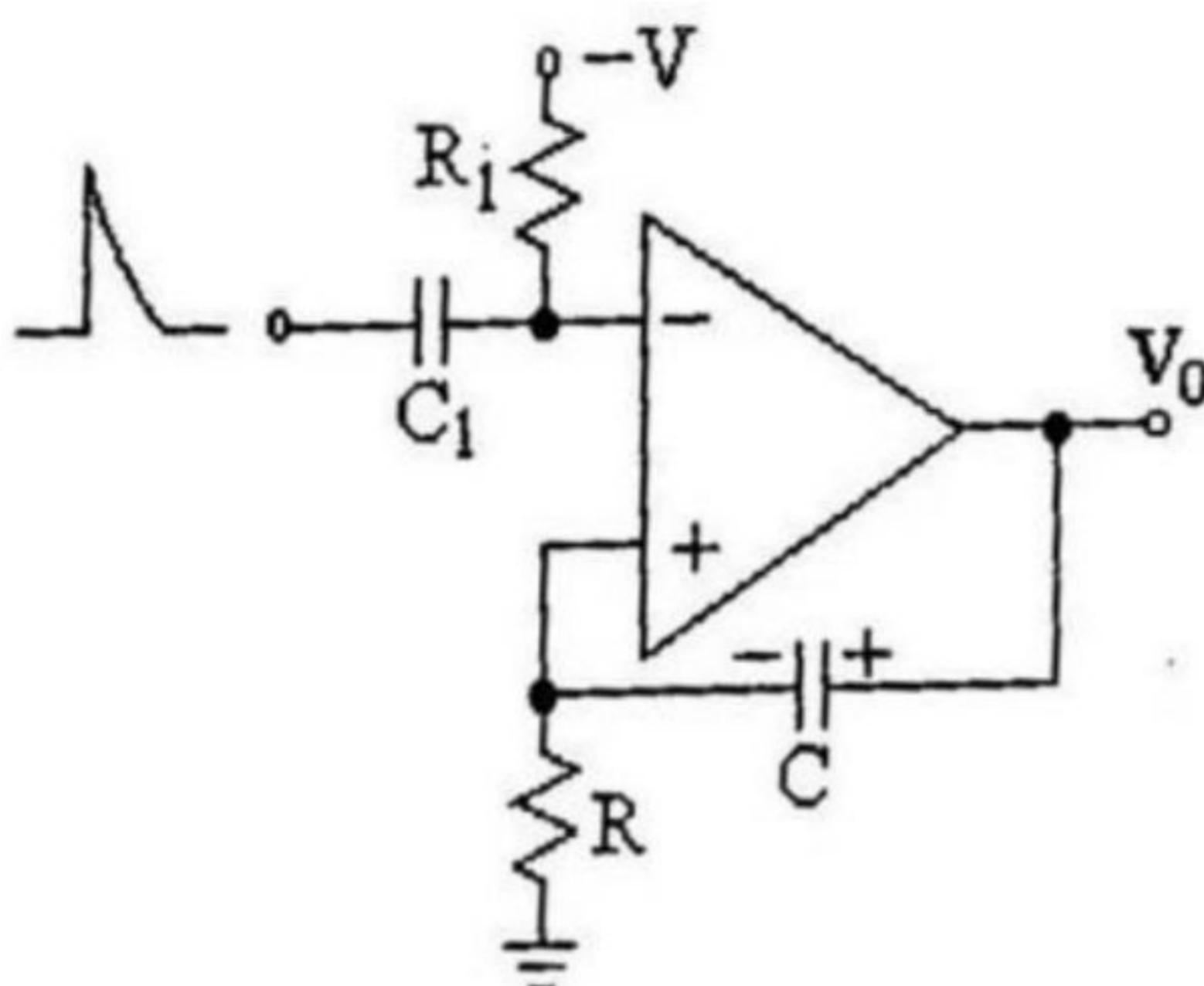
- A) 10KHz
- B) 1KHz
- C) 1MHz
- D) 1.44MHz

Feedback

B) 1KHz



After applying the trigger pulse the 0/2 output of the circuit becomes -----



- A) positive Vsat
- B) negative Vsat
- C) equals to voltage across C_1
- D) 0v

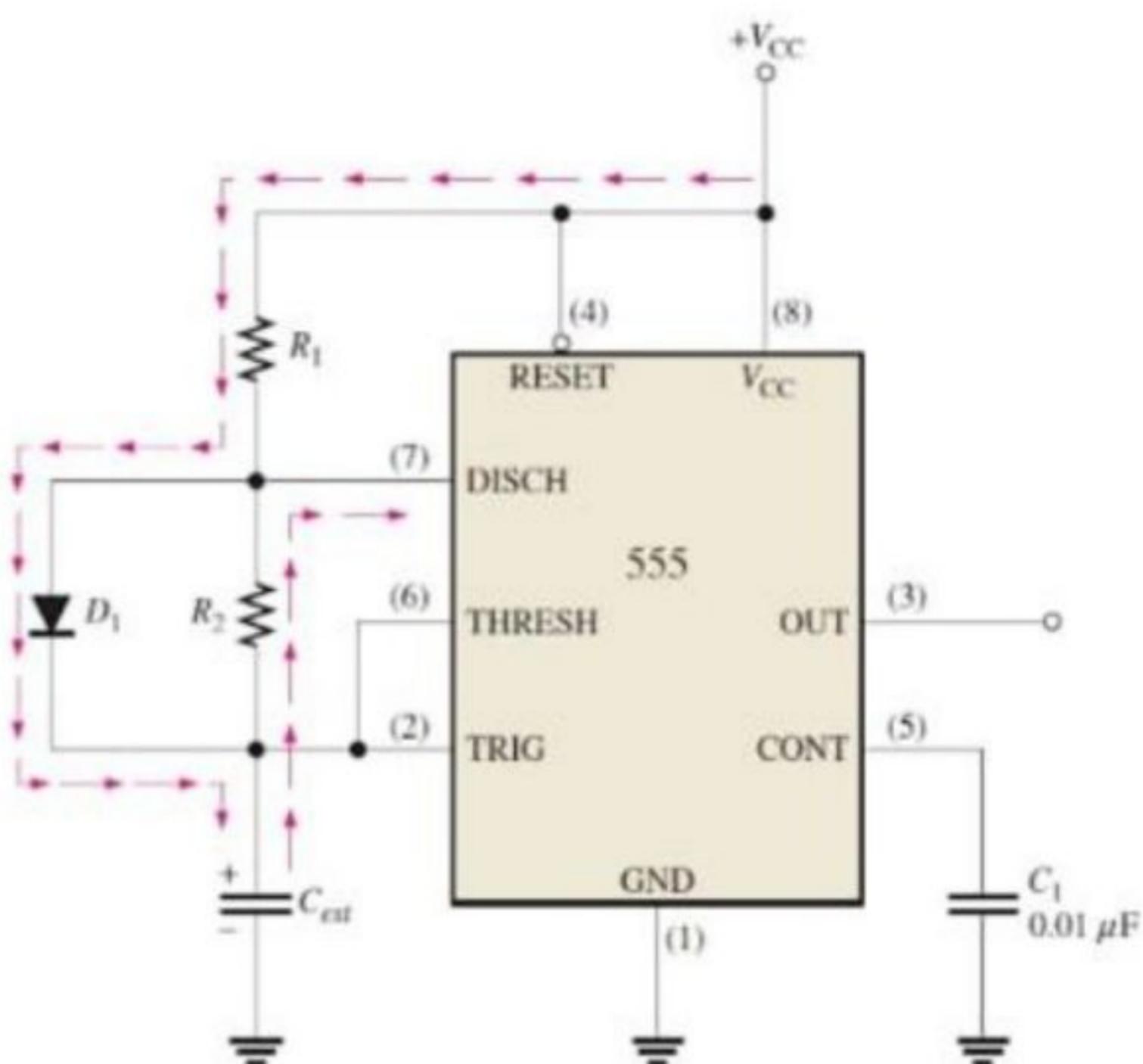
Correct answer

- B) negative Vsat

If the external resistor $R_1=R_2=1K$ 2/2



If the external resistor $R_1=R_2=1\text{K}$ Ohms, capacitor $C=1$ micro Farad, the output frequency at pin 3 will be -----



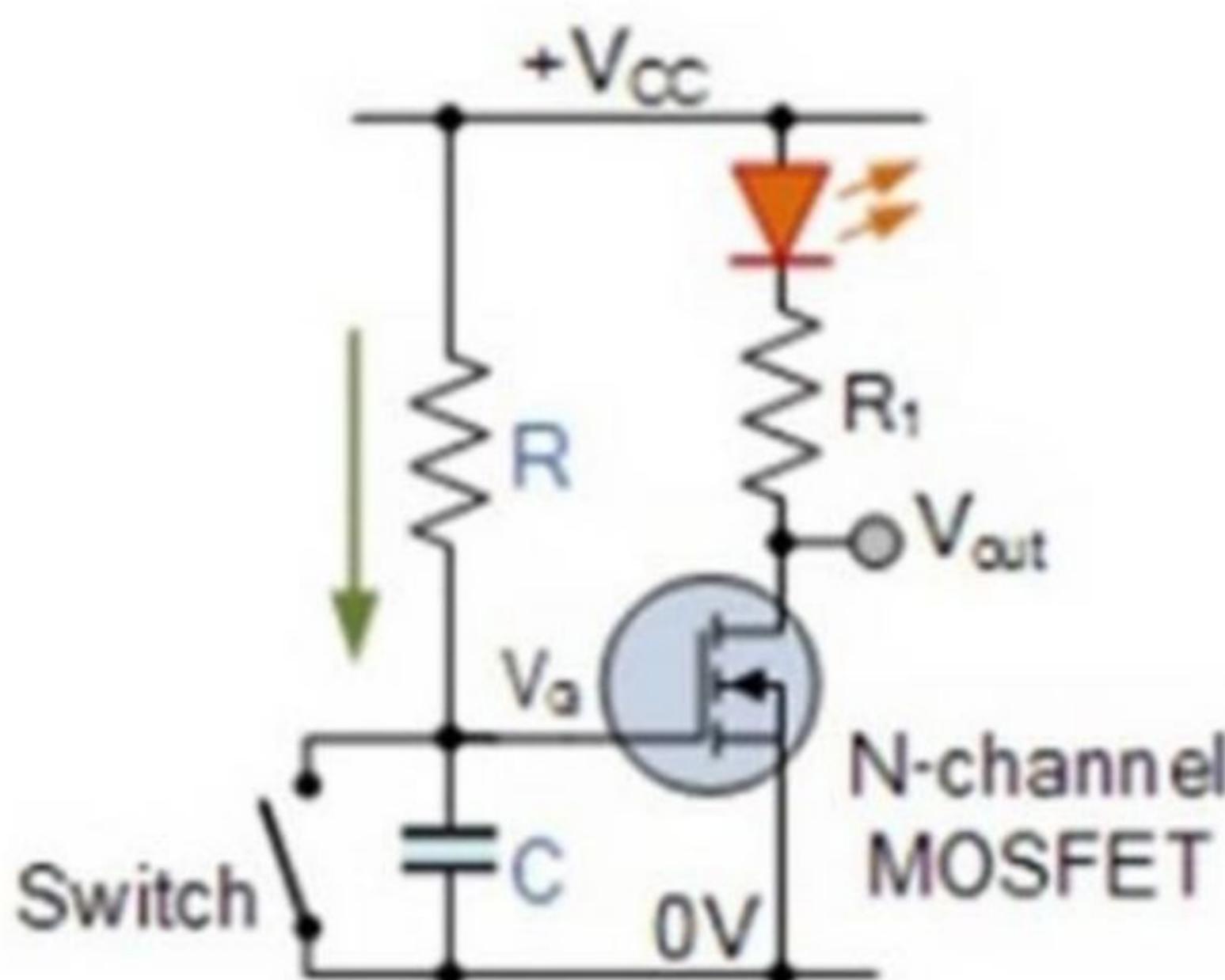
- A) 1.440KHz
- B) 720 Hz
- C) 1Khz
- D) 1MHz

Feedback

B) 720 Hz



The following circuit is an example 1/1
of -----



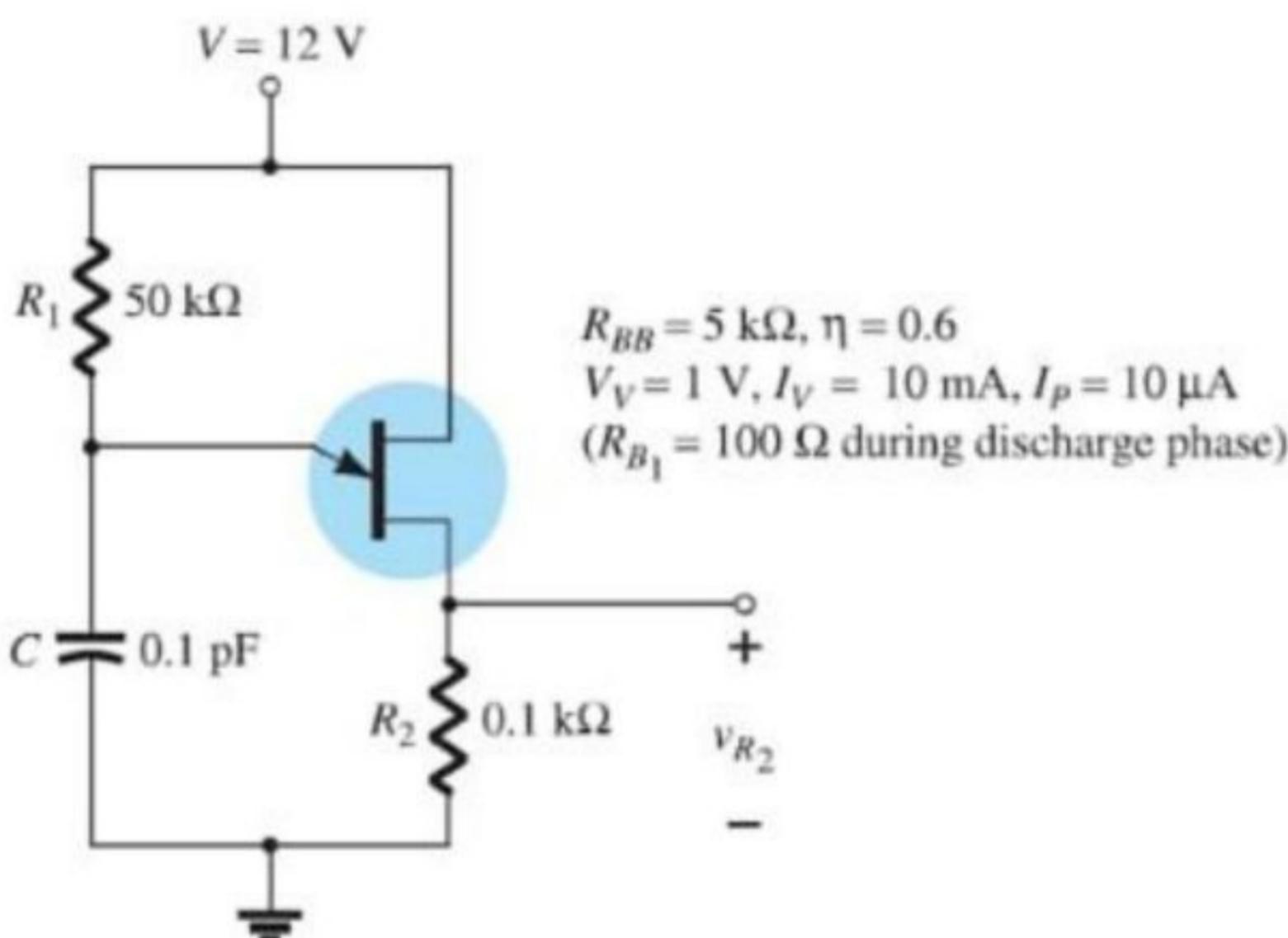
- A) Bistable multivibrator
- B) Astable multivibrator
- C) Monostable multivibrator
- D) Schmitt trigger

Feedback

C) Monostable multivibrator



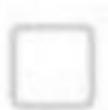
Given the relaxation oscillator using UJT. Find the peak voltage necessary to turn on the UJT at the emitter current=0, use the information beside the circuit.



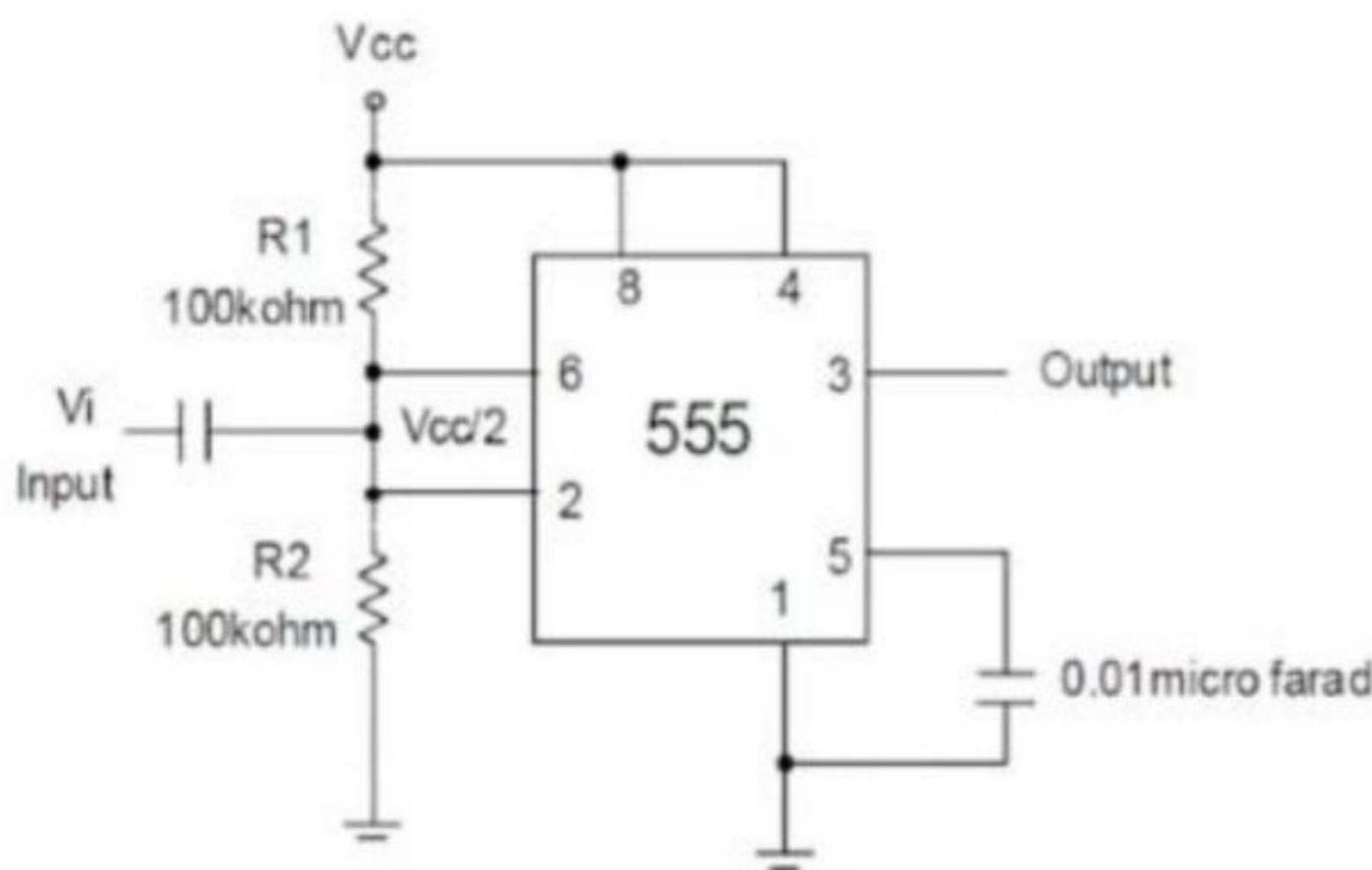
- A) 5v
- B) 7v
- C) 8v
- D) 5.5v

Feedback

C) 8v



The following circuit is an example 2/2
of -----



- A) Astable multivibrator
- B) Bistable multivibrator
- C) Monostable multivibrator
- D) Schmitt Trigger using 555 IC

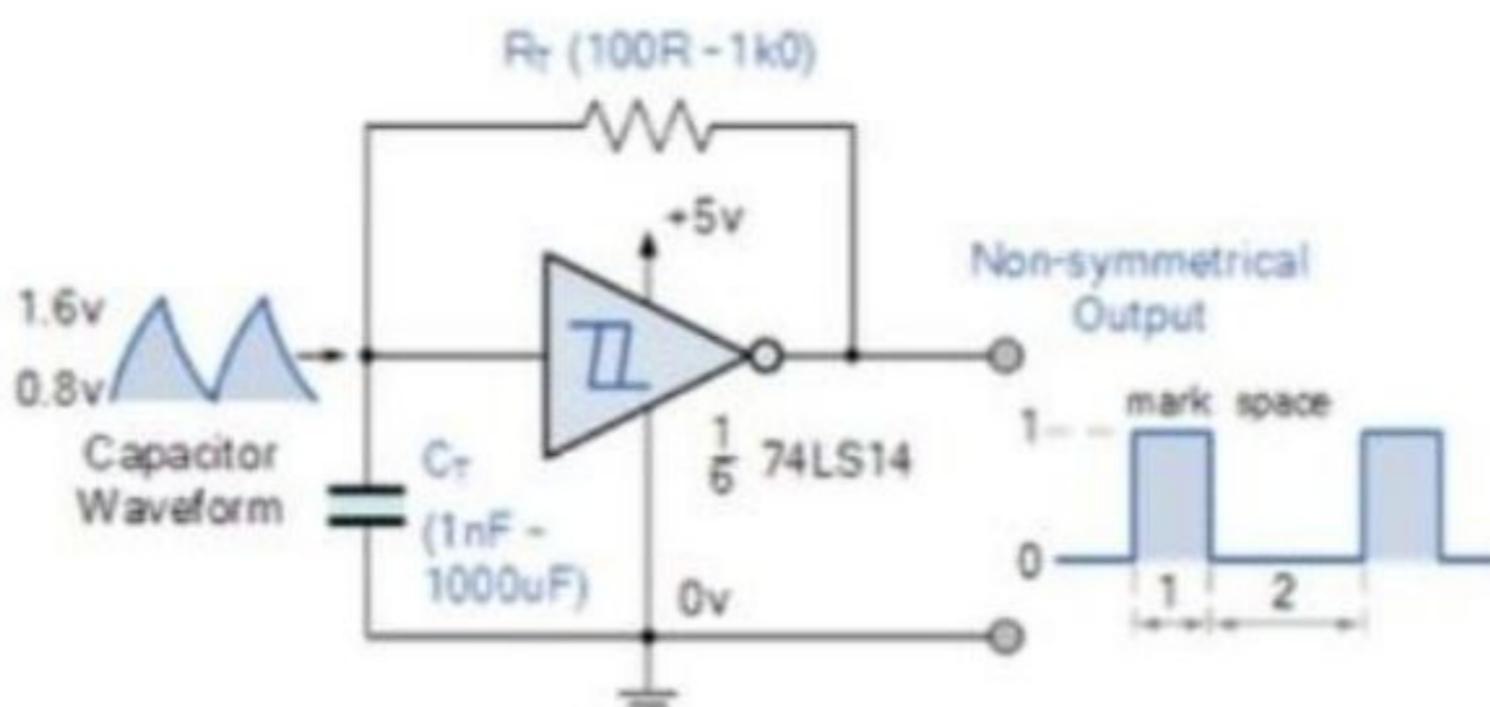
Feedback

D) Schmitt Trigger using 555 IC

B) The LTP and UTP of the circuit are - 2/2
-----.



The LTP and UTP of the circuit are - 2/2



- A) 0v and 1v
- B) 0v and 5v
- C) 0.8v and 1.6v

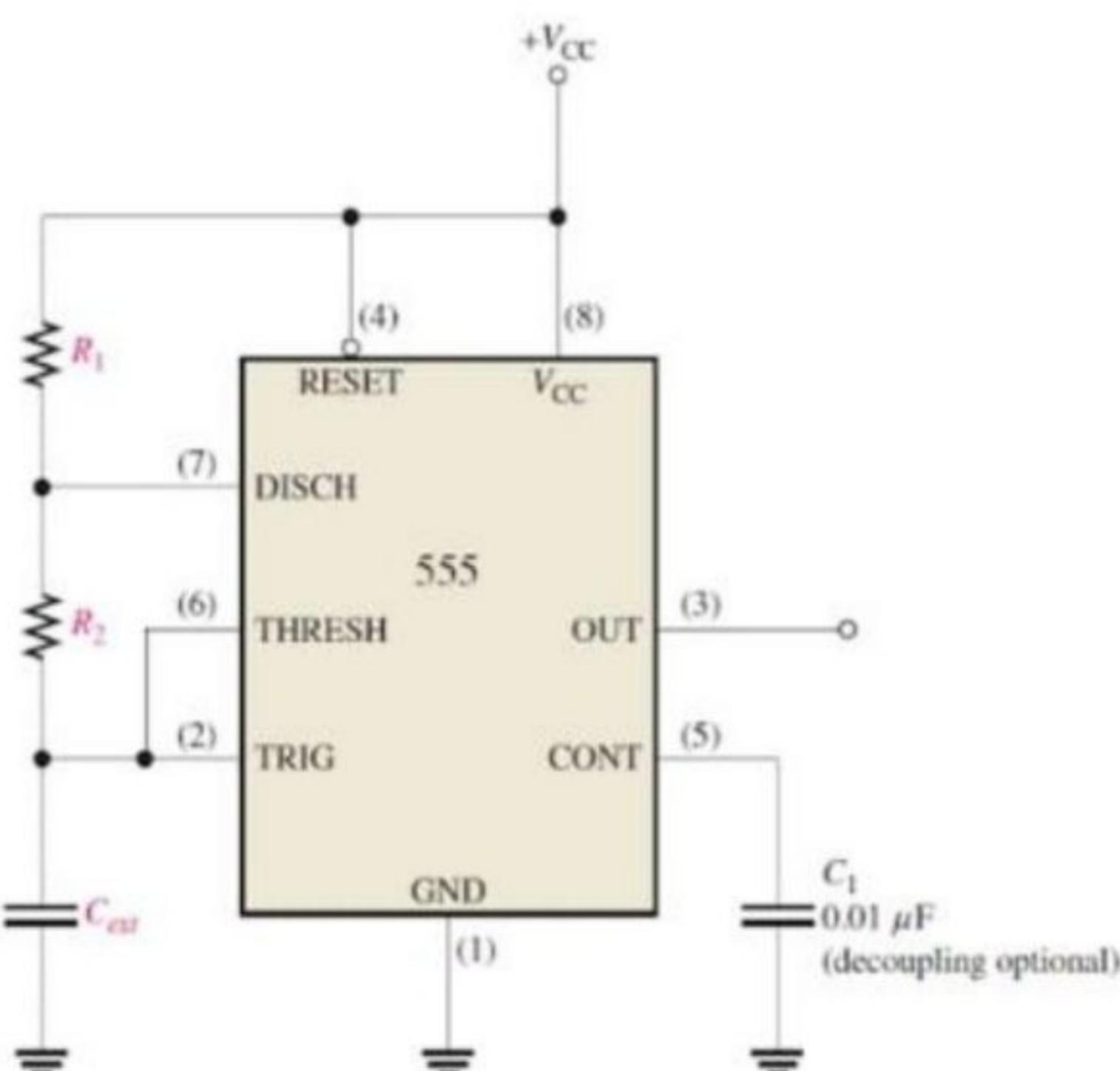
Feedback

C) 0.8v and 1.6v

If the external resistors $R_1=R_2=5K$ 0/3 Ohms, capacitor $C=10$ micro Farad,
the duty cycle of the output at pin 3
will be -----



If the external resistors $R_1=R_2=5K$ Ohms, capacitor $C=10$ micro Farad, the duty cycle of the output at pin 3 will be -----



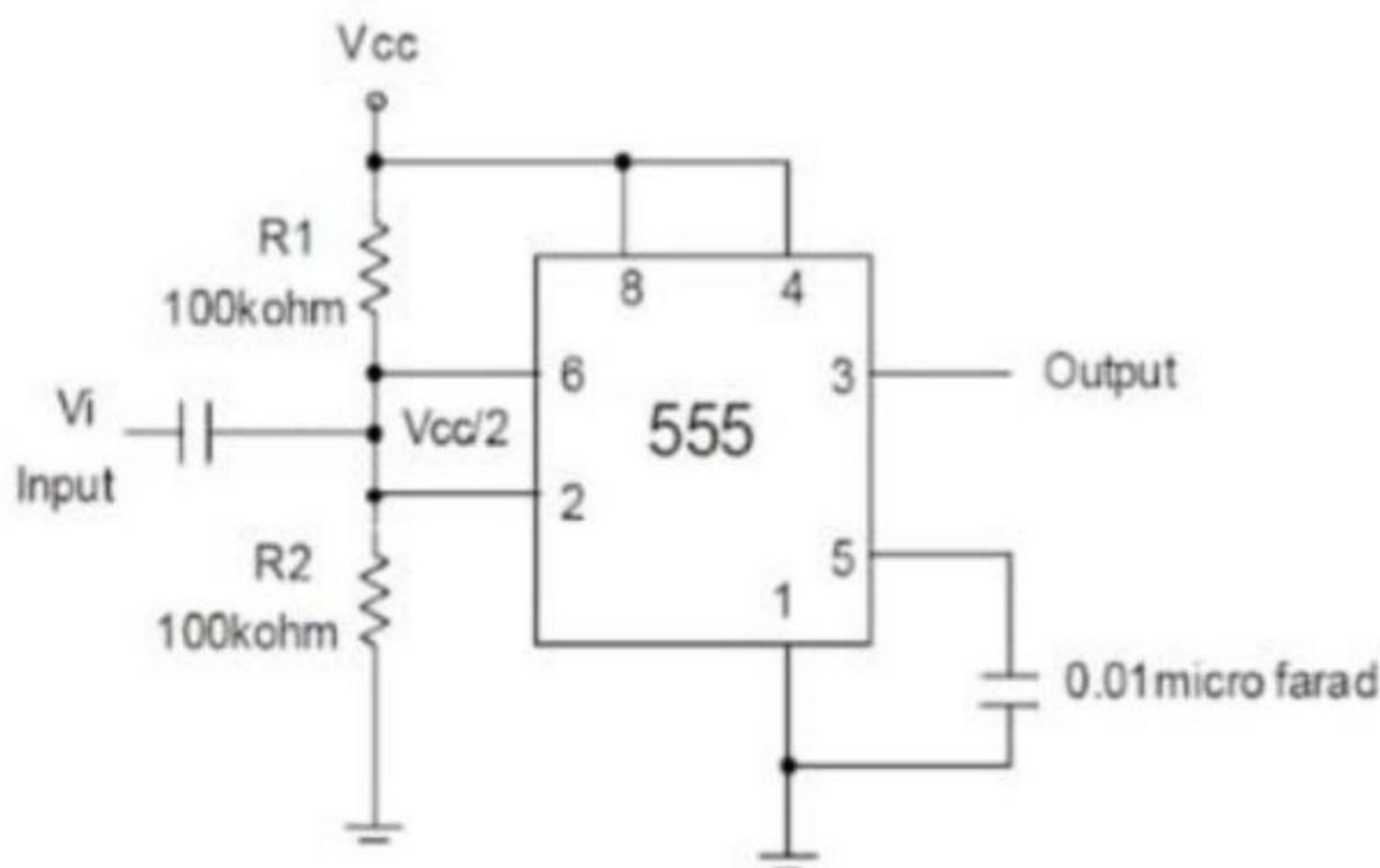
- A) 50%
- B) 33.33%
- C) 66.66%
- D) 60%

Correct answer

- C) 66.66%



If the input voltage becomes lower than one-third of the Vcc, the output becomes -----.



- A) equals to +Vsat
- B) equals to input voltage
- C) equals to -Vsat

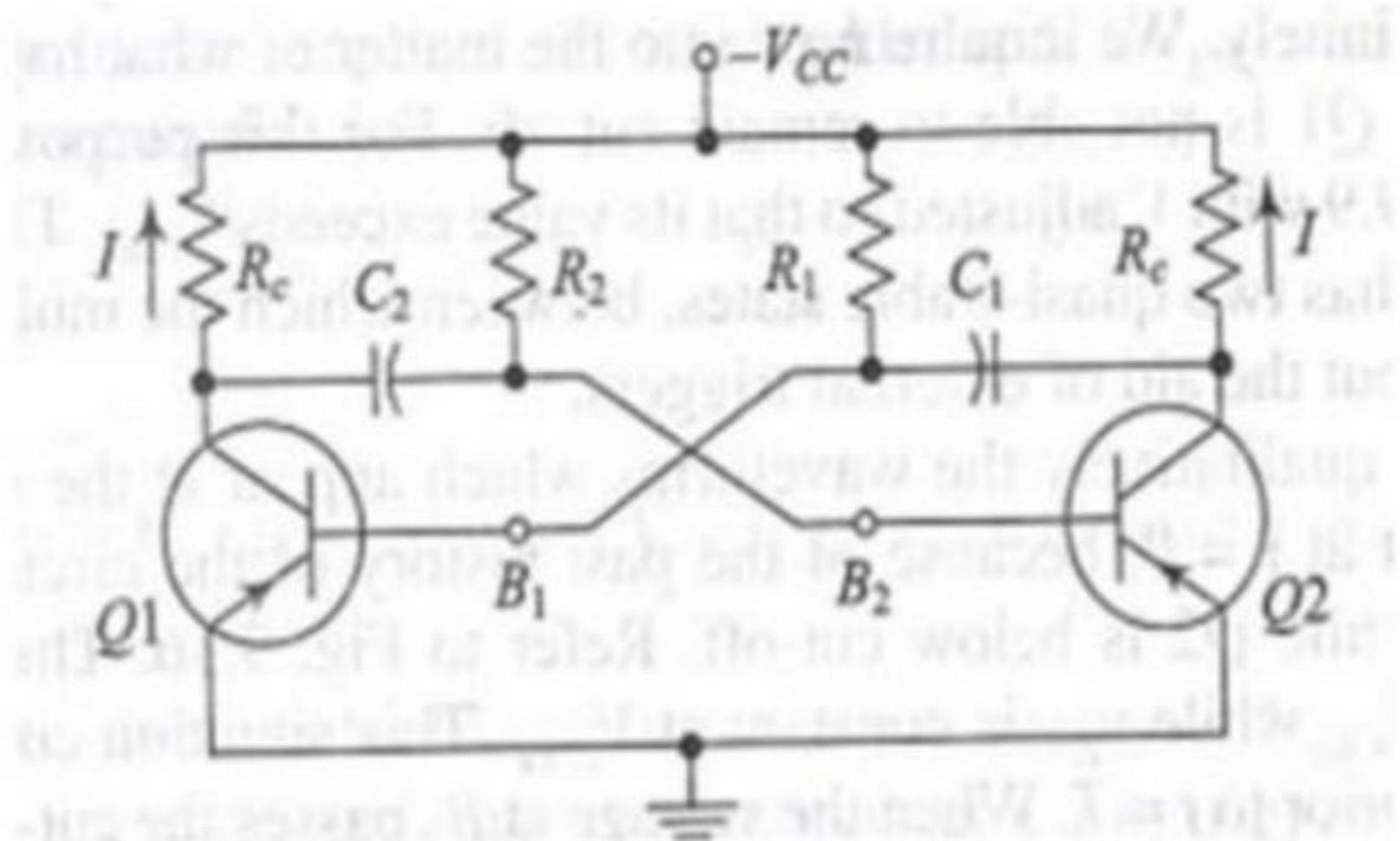
Feedback

A) equals to +Vsat

The ON time for the transistor Q2
of the following circuit can
approximately be found by the



The ON time for the transistor Q2 0/2 of the following circuit can approximately be found by the equation -----.



- A) Q2 ON time = $0.69R_1C_1$
- B) Q2 ON time = $0.69R_2C_2$
- C) Q2 ON time = $1.38R_1C_1$
- D) Q2 ON time = $0.69(R_1C_1+R_2C_2)$

Correct answer

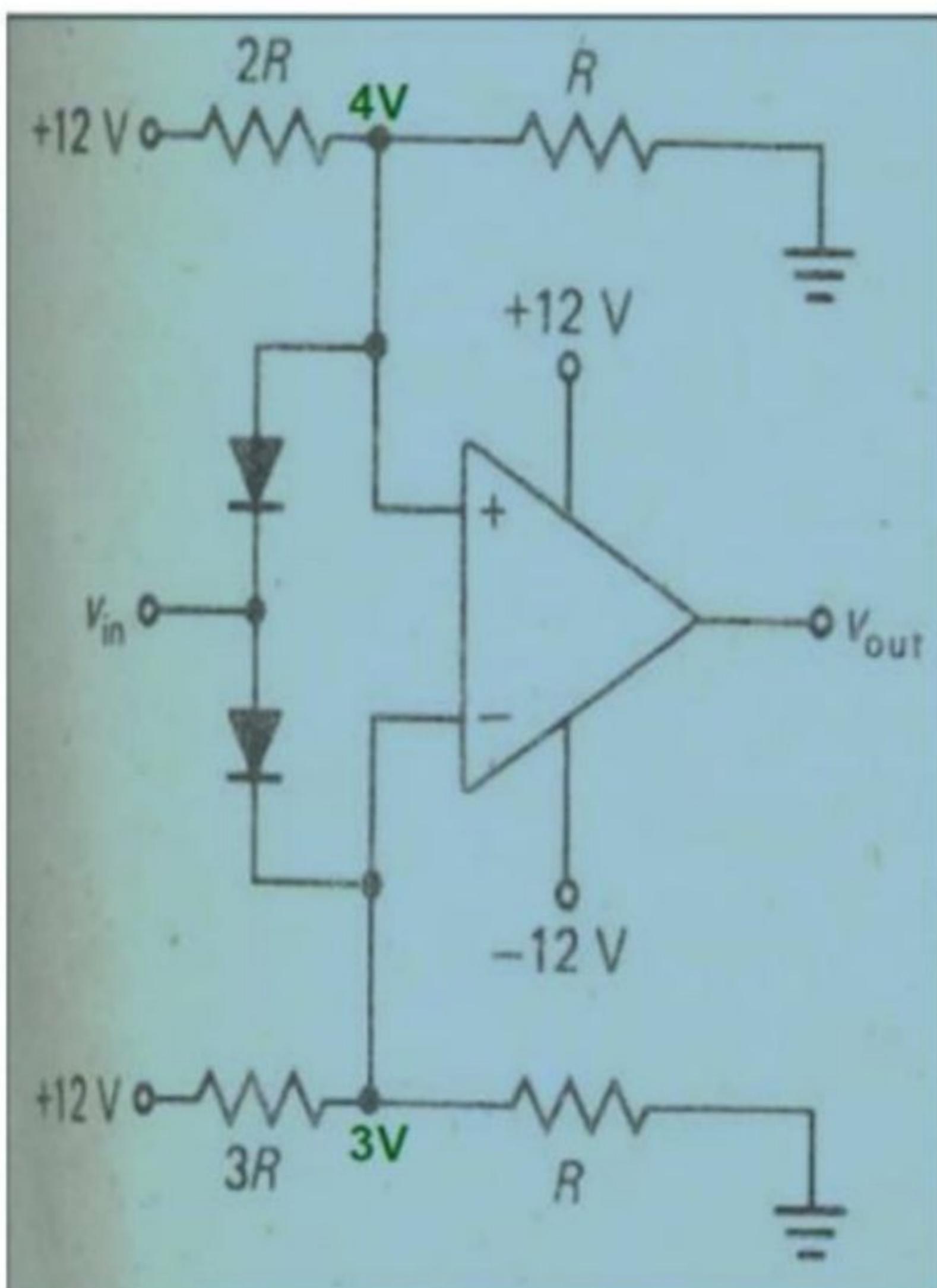
- A) Q2 ON time = $0.69R_1C_1$

Q The following circuit is ----- 1/1



The following circuit is -----.

1/1



- A) Bistable multivibrator
- B) Astable multivibrator
- C) Monostable multivibrator
- D) Schmitt trigger
- E) Window Comparator

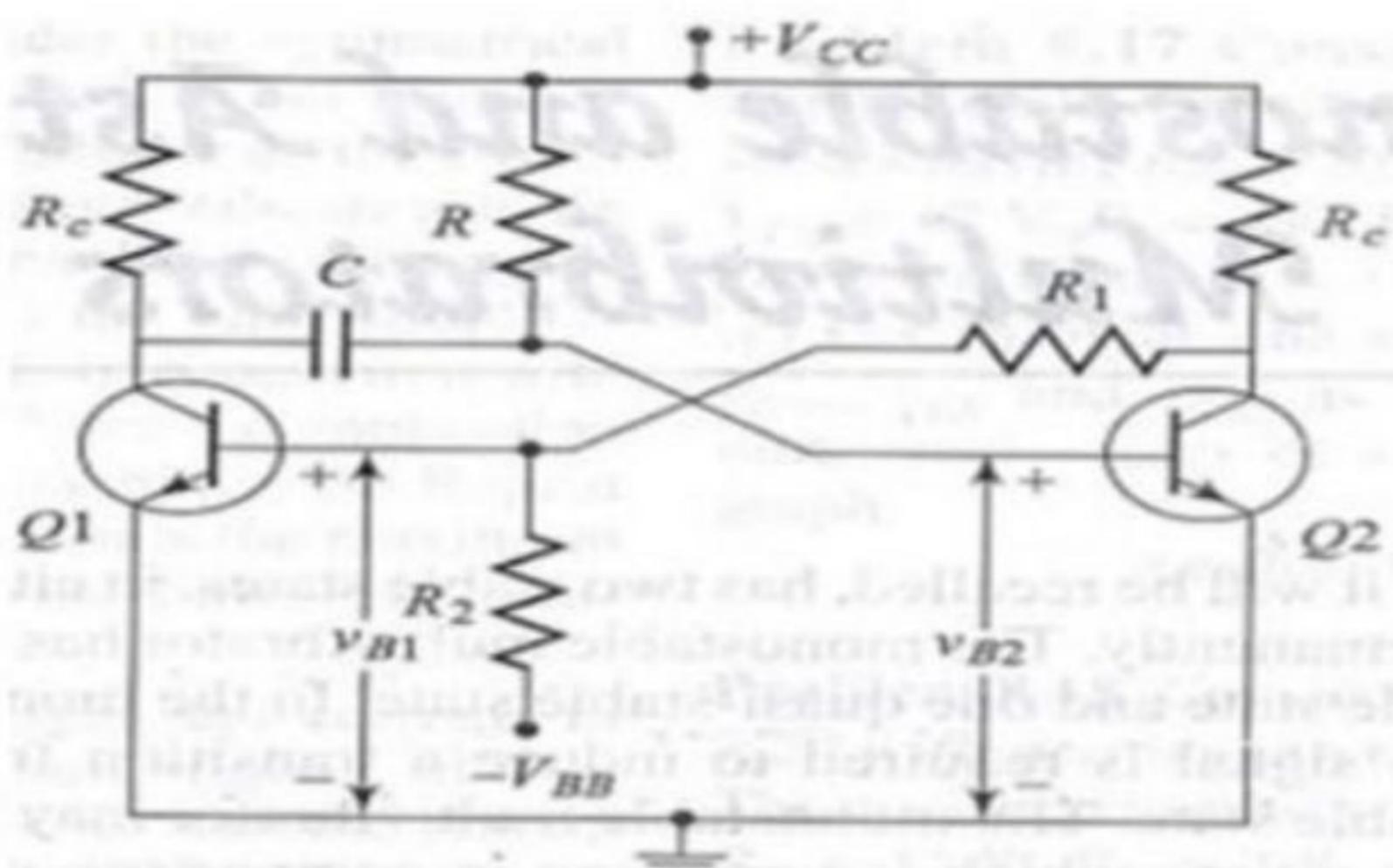


E) Window Comparator

Feedback

E) Window Comparator

After applying +ve trigger pulse at 2/2
the base of Q1, the capacitor will
take charge through the resistor --



- A) R_c
- B) R_1
- C) R
- D) R_2

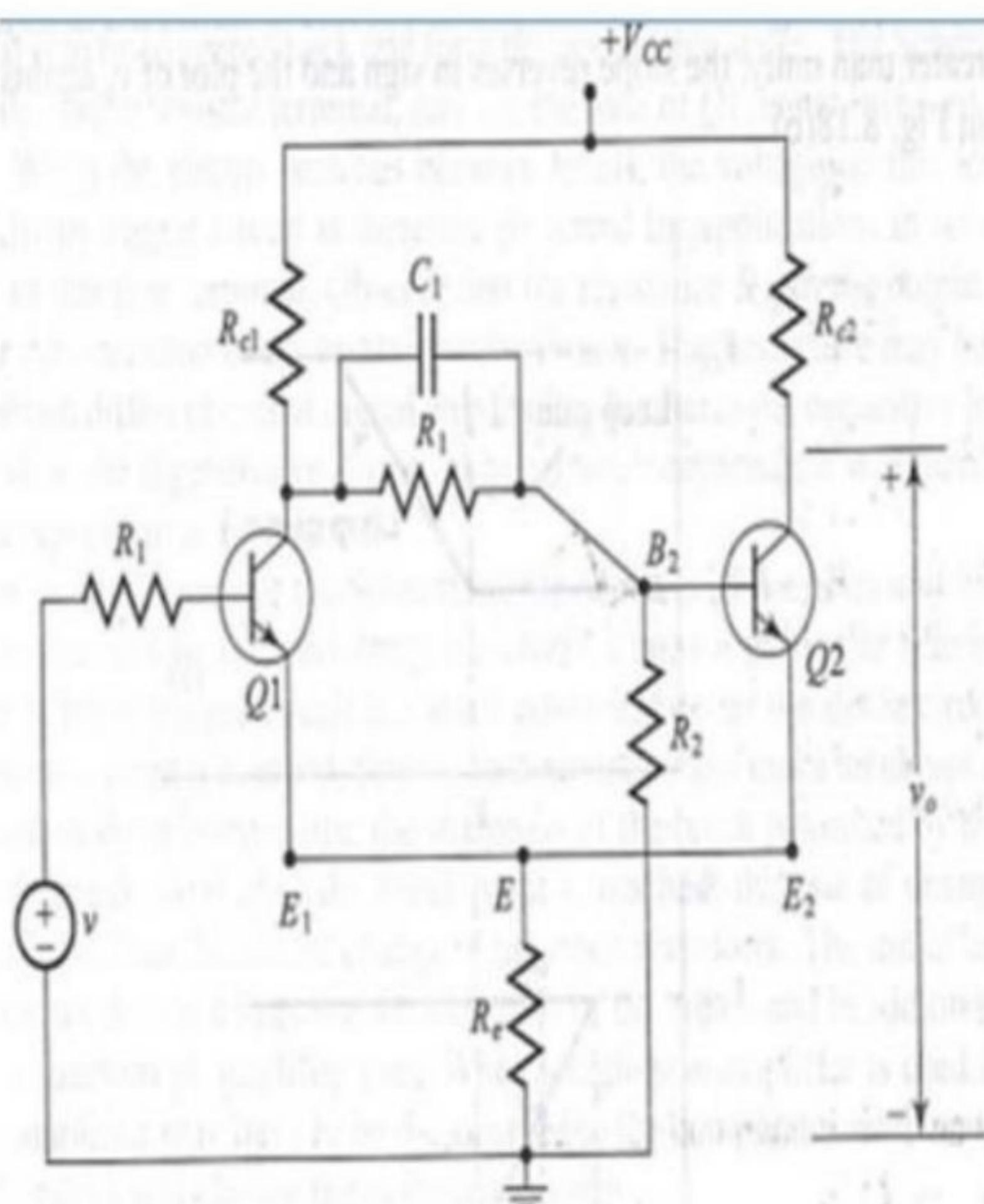


D) R2

Feedback

c) R

At the input voltage below the LTP 0/2 of the circuit, the base voltage of Q2 becomes ----- its emitter voltage at E2



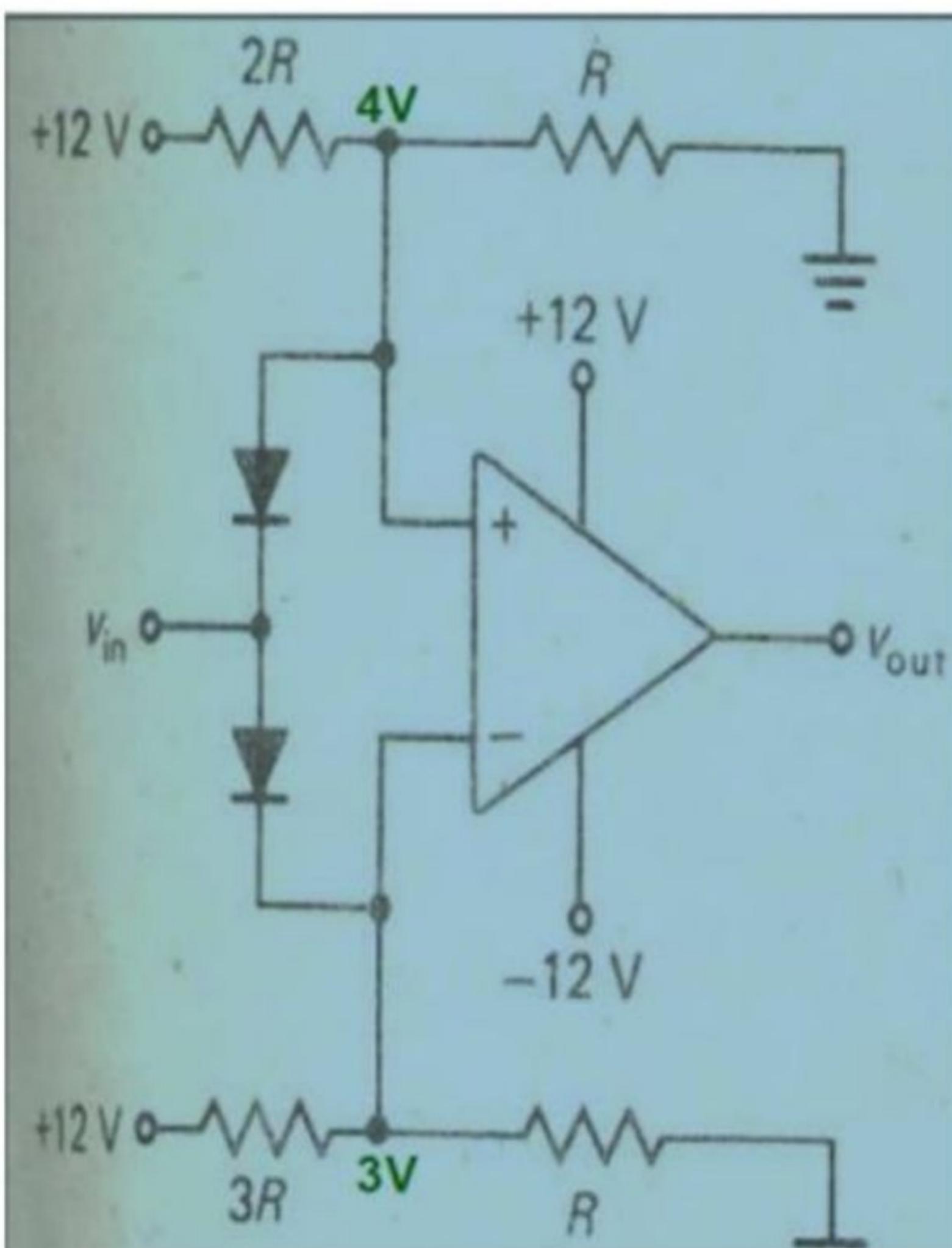
- A) lower than
- B) equals to
- C) higher than

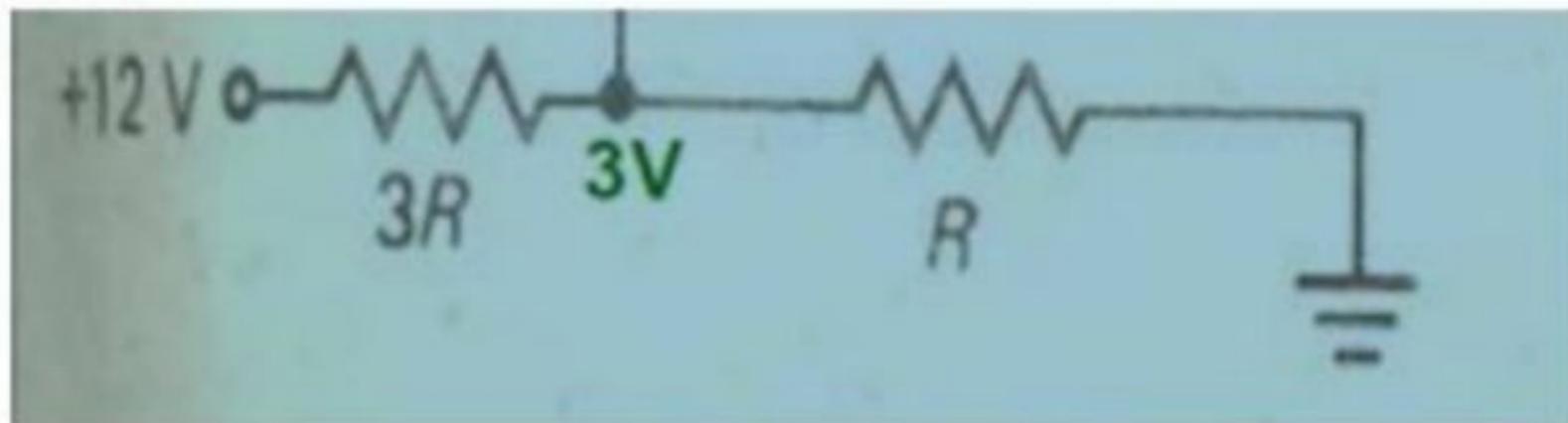
Correct answer

- C) higher than

The LTP and UTP of the circuit are - 2/2

-----.



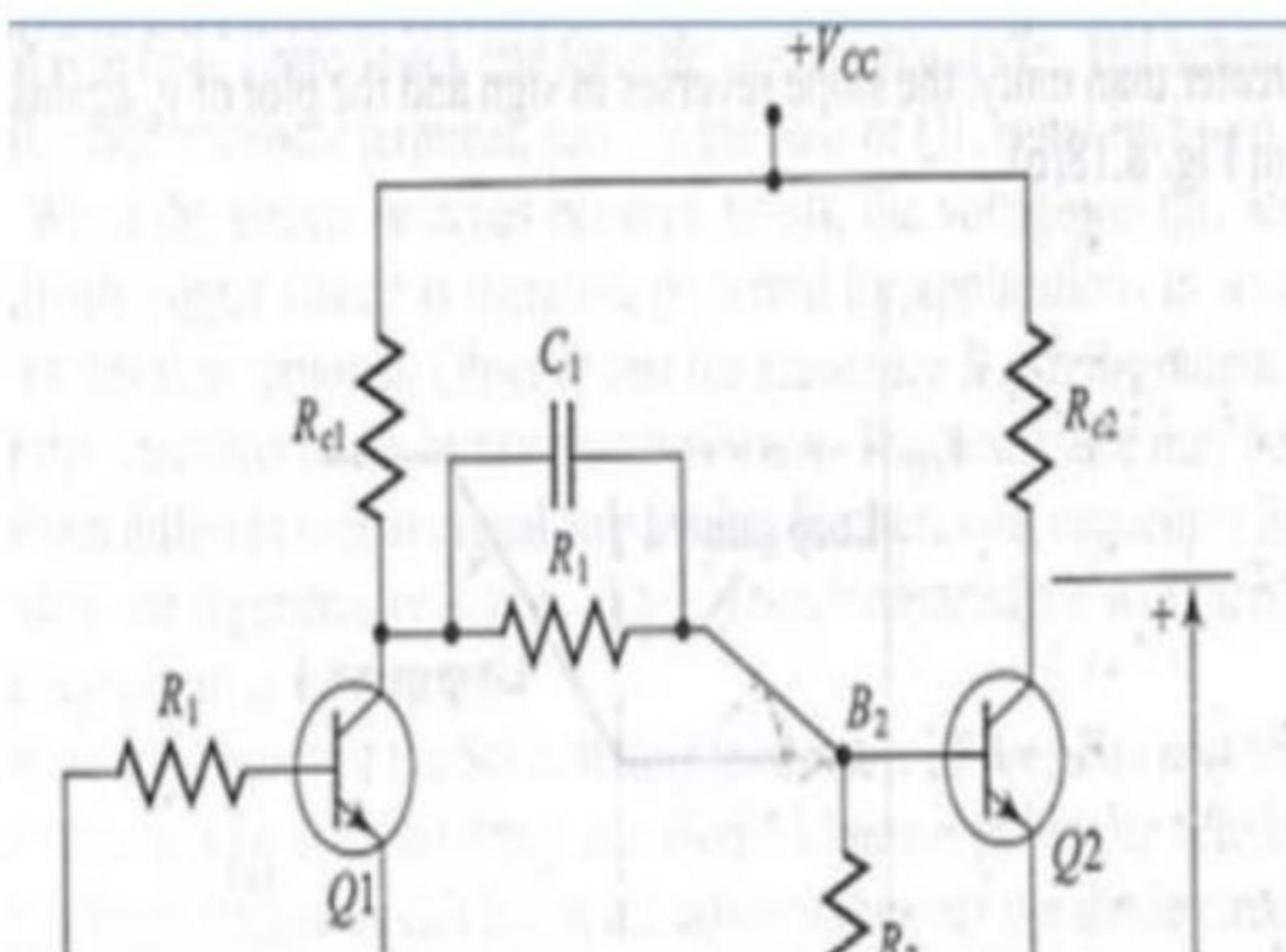


- A) 3V and 4V
- B) 3.7V and 4.7V
- C) 2.3V and 4.7V

Feedback

C) 2.3V and 4.7V

After exceeding the UTP voltage of 0/2
the input the transistors ----



Noakhali Science and Technology University

Department of Computer Science and Telecommunication Engineering

2nd Year 2nd Term B.Sc. (Engg.)

Session: 2019-20 Final Examination- January, 2023

Course Code: CSTE 2201

Course Title: Object Oriented Programming with JAVA

Time: 4 hours.

Total Marks: 70

[Answer any seven of the following questions. Figures in the right hand margin indicate full marks]

1. a) Define bytecode. Why does Java use Unicode? 2
b) What are the three main principles of object-oriented programming? Explain. 3
c) You know there are four integer types: int, short, long, and byte. However, char can also be categorized as an integer type in Java. Why? 3
d) "Java allows variables to be initialized dynamically"-do you agree with the statement? Justify your answer with an example. 2

2. a) What is type conversion and casting? Explain with proper examples. 2
b) Why java became platform independent language? Explain briefly. 3
c) Analyze the following programs to find the output and also give proper explanation. 5

(i)

```
public class Test{  
    public static void main(String[] args) {  
        int count =1;  
        while (count<=15){  
  
            System.out.println(count%2==1?"***":"++++");  
            ++count;  
        }  
    }  
}
```

(ii)

```
public class OperatorExample{  
    public static void main(String args[]){  
          
        int a=10;  
        int b=10;  
        System.out.println(a++ + ++a);  
        System.out.println(b++ + b++);  
    }  
}
```

3. a) Differentiate between a class and an object. What do you mean by **this** keyword? Explain with an example. 1+2
b) Show a program that uses an array to find the average of 10 double values. Moreover, examine the output of the following fragment. Explain. 3+2

```
class Equals  
{  
    public static void main(String [] args)  
    {  
        int x = 100;  
        double y = 100.1;  
        boolean b = (x = y);  
        System.out.println(b);  
    }  
}
```

- c) Why is synchronization necessary? Explain with the help of a relevant example. 2

4. a) What is method overloading? Explain with an example program. 2
b) Discuss about the method overloading and constructor overloading with an example. 3
c) Write a java program to implement visibility controls such as public, private, protected access modes. Assume suitable data, if any. 5

- 5.** a) How do you prevent a subclass from having access to a member of a superclass? Create a subclass of **TwoDShape** called **Circle**. Include an area() method that computes the area of the circle and a constructor that uses super to initialize the **TwoDShape** portion. 2+3
- b) What is an abstract class? “A class that contains at least one abstract method must, itself, be declared abstract”- Is it true or False? Answer accordingly. 1.5+
- c) “A superclass reference can refer to a subclass object.”- Explain why this is important as it relates to method overriding. 1.5
- 6.** a) What is inheritance? Explain the benefits of inheritance with an example. 2
- b) Explain the usage of abstract classes and methods? With an example program. 3
- c) Write a java program to implement multilevel inheritance with 4 levels of hierarchy. 4
- 7.** a) What is garbage collection in Java? Explain finalize method in Java. 3
- b) Compare and Contrast differences between interfaces vs abstract classes. 3
- c) Analyze the following programs to find the output and also give proper explanation. 4
- (i)
- ```
public class Test2 {
 public static void main(String[] args) {
 StringBuffer s1 = new StringBuffer("Complete");
 s1.setCharAt(1,'i');
 s1.setCharAt(7,'d');
 System.out.println(s1);
 }
}
```
- (ii)
- ```
abstract class MyFirstClass {
    abstract num (int a, int b) { }
}
```
- 8.** a) What is an exception? Explain how an exception can be handled in Java? And also list the benefits of Exception Handling. 4
- b) Distinguish between exception and error. 2
- c) Define an exception called “NotEqualException” that is thrown when a float value is not equal to 3.14. Write a java program that uses the above user defined exception. 4
9. a) What is multithreading? Explain with proper example. 3
- b) Explain applet life cycle with suitable diagram also Distinguish various differences between Swing and AWT. 4
- c) Analyze the following program to find the output and also give proper explanation. 3
- ```
public static synchronized void main(String[] args) throws
 InterruptedException {
 Thread f = new Thread();
 f.start();
 System.out.print("A");
 f.wait(1000);
 System.out.print("B");
}
```

Noakhali Science and Technology University

Department of Computer Science and Telecommunication Engineering

2<sup>nd</sup> Year 2<sup>nd</sup> Term B.Sc. (Engg.)

Session: 2019-20

Final Examination- January, 2023

Course Title: Signals and Systems

Course Code: CSTE 2205

Total Marks: 70

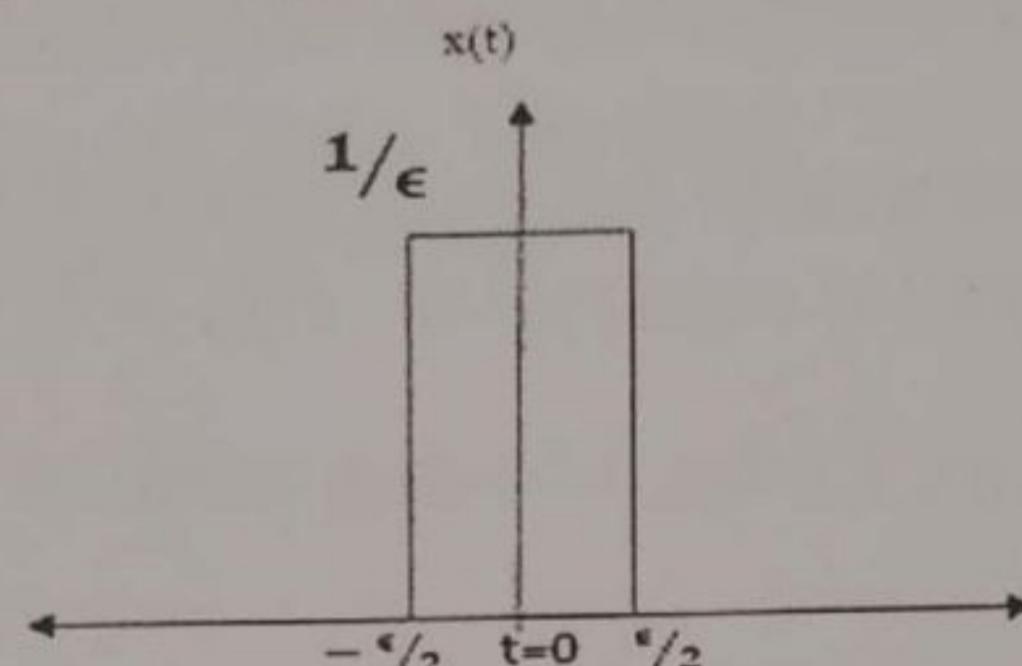
Time: 3 hours.

[Answer any seven of the following questions. Figures in the right hand margin indicate full marks]

1. a) Why do we need to transform physical variables into signals? Why we need to study signals and systems in Computer Science? 3

- b) Define with figure: Odd signal, Even signal, Periodic signal. 3

- c) 4



Define unit impulse function. How can we get unit impulse function from this rectangular pulse?

2. a) Give an example of a linear time-varying system such that with a periodic input the corresponding output is not periodic. 3

- b) Show that the complex exponential signal  $x(t) = e^{j\omega_0 t}$  is periodic and that its fundamental period is  $2\pi/\omega_0$ . 7

3. a) Function x(t) is given by the following equation: 5

$$x(t) = \begin{cases} t + 1, & -1 \leq t \leq 0 \\ 1, & 0 < t \leq 2 \\ 0, & \text{otherwise} \end{cases}$$

Now, Plot x(t) and then find the expression for x(-t) and x(3-t) and plot the functions.

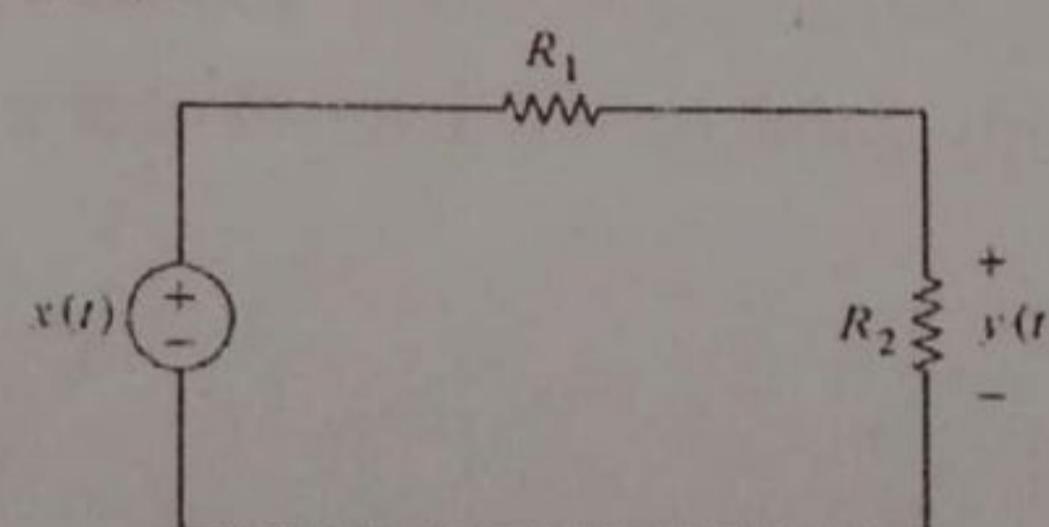
- b) Determine whether the signal is periodic or not. If the signal is periodic compute its fundamental period: 5

- i)  $x(t) = \cos(t + \pi/4)$
- ii)  $x(t) = \sin^2 t$
- iii)  $x(t) = 3e^{-j12t}$
- iv)  $x(t) = 2\cos 2\pi t + 4\cos 15\pi t$

4. a) When a system is said to be a linear system explain with diagram. 4

- b) Consider the voltage divider circuit 4

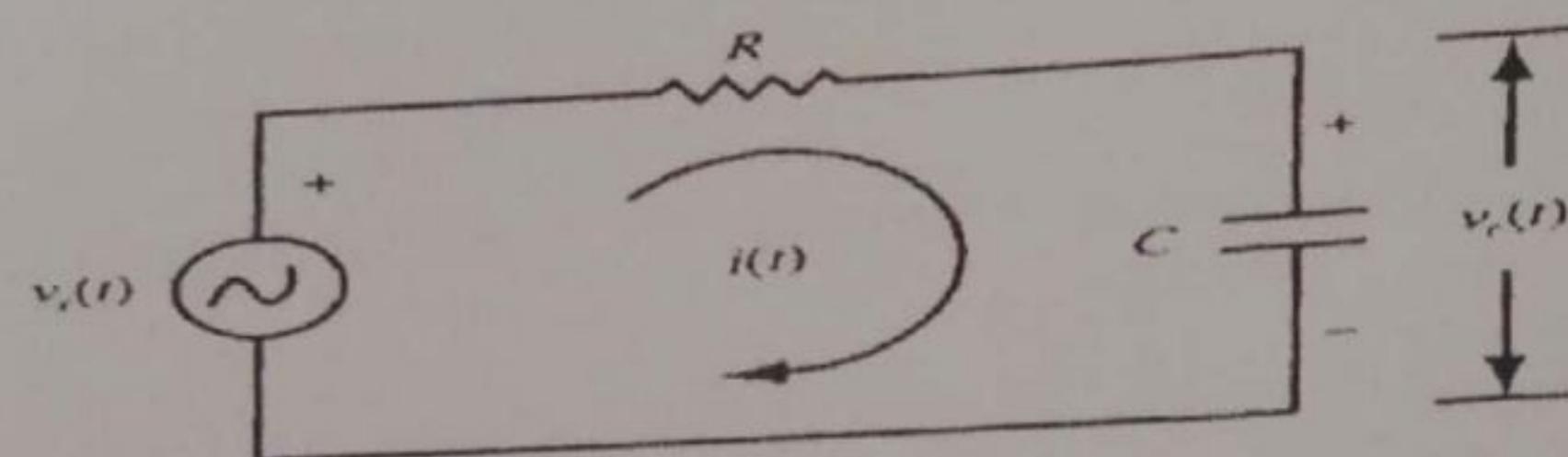
$$y(t) = \frac{R_2}{R_1 + R_2} x(t)$$



If  $R_1 = R_2$ , would it be linear or non-linear system?

- c) Write about multiplication and convolution properties of Fourier series. 2

5. a) Consider the  $RC$  circuit shown in the following figure. Find the relationship between the input  $x(t)$  and the output  $y(t)$ .

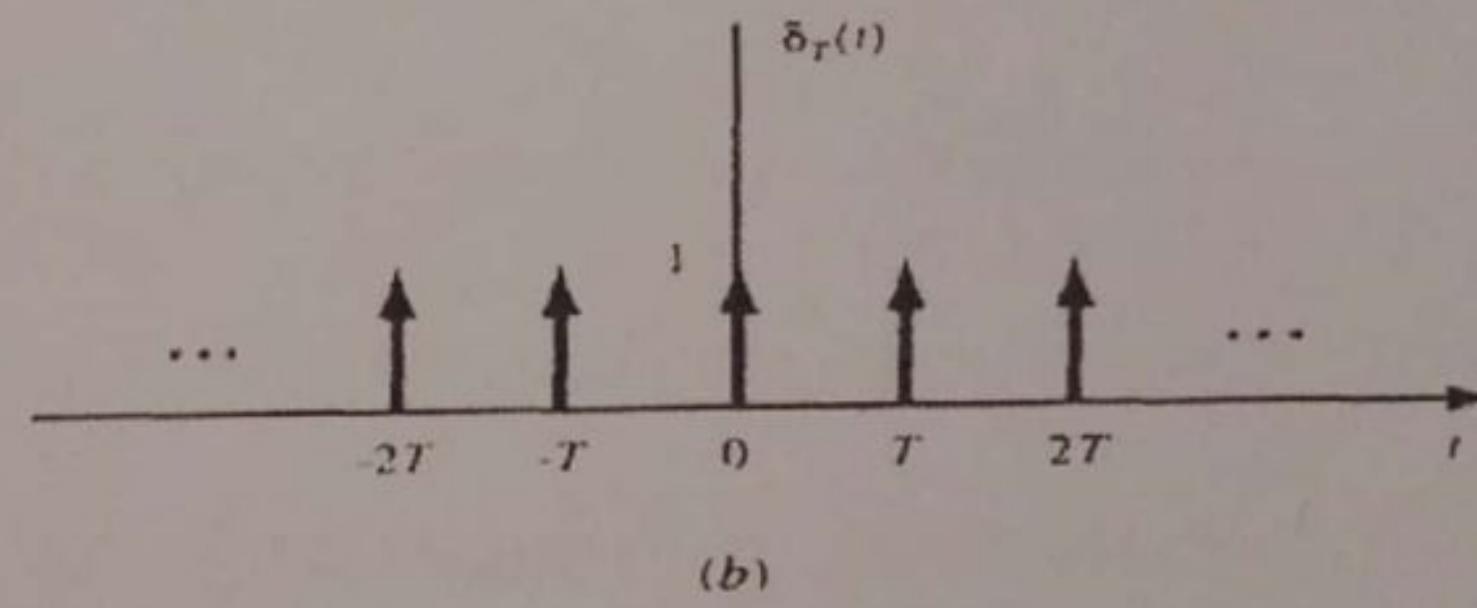
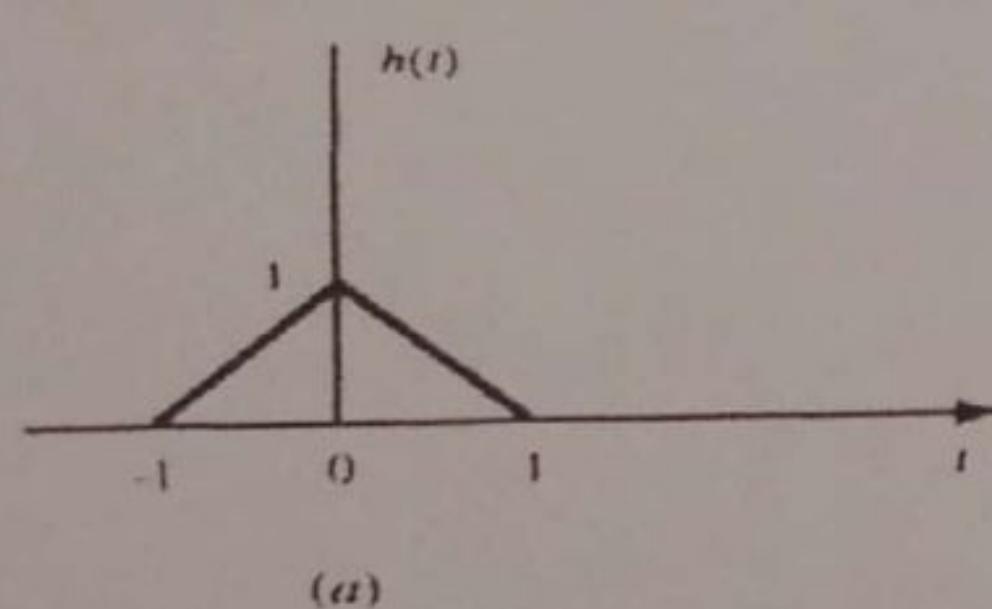


- (a) If  $x(t) = v_s(t)$  and  $y(t) = v_c(t)$ .  
 (b) If  $x(t) = v_s(t)$  and  $y(t) = i(t)$ .

- b) Let  $h(t)$  be the triangular pulse shown in the following figure (a) and let  $x(t)$  be the unit impulse train in the following figure (b) expressed as  $x(t) = \sum_{n=-\infty}^{\infty} \delta_T(t - nT)$

Determine and sketch  $y(t) = h(t) * x(t)$  for the following values of  $T$ : (i)  $T = 3$  (ii)  $T = 2$

(iii)  $T = 1.5$



6. a) Define Zero state and Zero input response of a system.  
 b) Consider the differential equation of an LTI system:

$$\frac{dy(t)}{dt} + 2y(t) = x(t); y(0) = 1$$

Where  $x(t) = ke^{3t}u(t)$ ,  $k$  is a real number.

Calculate the output response of the system.

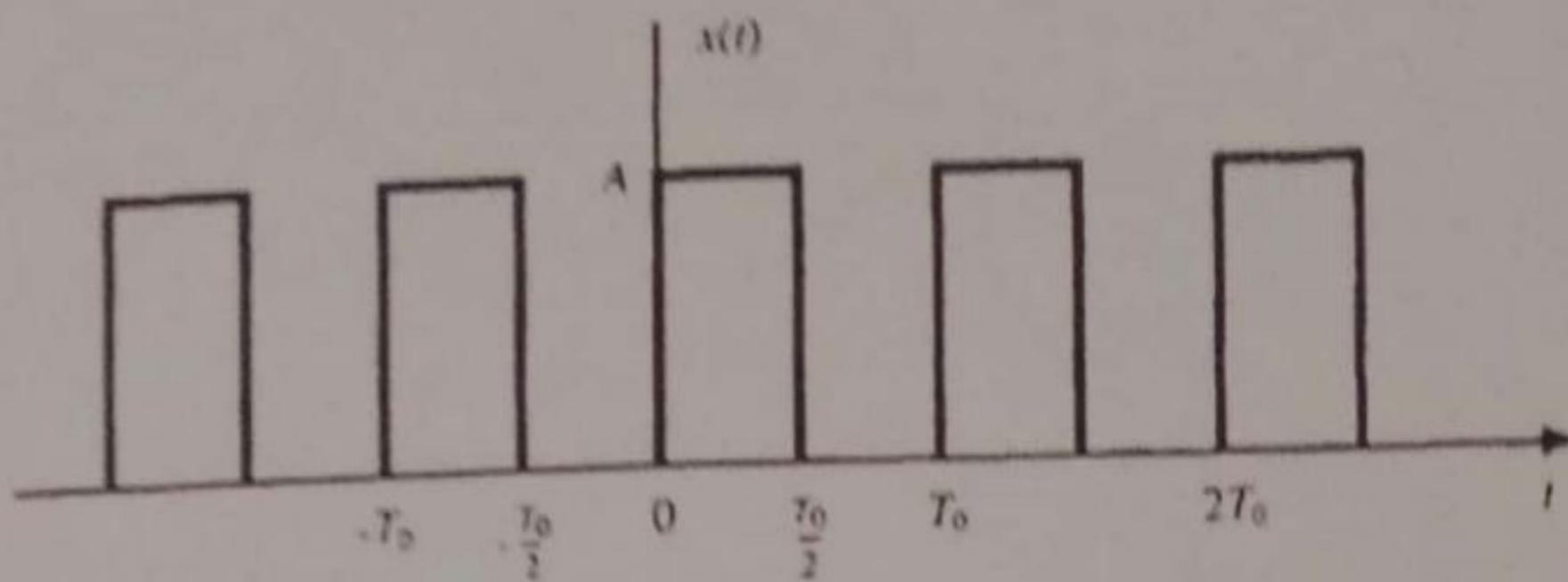
7. a) We call a set of signals  $\{\Psi_n(t)\}$  orthogonal on an interval  $(a, b)$  if any two signals  $\Psi_m(t)$  and  $\Psi_k(t)$  in the set satisfy the condition

$$\int_a^b \Psi_m(t) \Psi_k^*(t) dt = \begin{cases} 0 & m \neq k \\ \alpha & m = k \end{cases}$$

where  $*$  denotes the complex conjugate and  $\alpha \neq 0$ . Show that the set of complex exponentials  $\{e^{jk\omega_0 t}; k = 0, \pm 1, \pm 2, \dots\}$  is orthogonal on any interval over a period  $T_0$ ,

where  $T_0 = 2\pi/\omega_0$ .

- b) Consider the periodic square wave  $x(t)$  shown in Figure. Determine the trigonometric Fourier series of  $x(t)$ .



8. a) Establish the relationship between trigonometric and exponential Fourier series. 5

b) Verify the time shifting property of Fourier Transform. 2

c) Implement the Fourier Transform of the signal: 3

$$x(t) = e^{-at|t|} \text{ Where,}$$

$$= \begin{cases} e^{-at} & t > 0 \\ e^{at} & t < 0 \end{cases}$$

9. a) What is ROC? Calculate Laplace Transform of the following signal and sketch the pole-zero plot with the ROC: 1+4

$$x(t) = e^{rt}$$

b) Compute the inverse Laplace Transform of the following  $X(s)$ : 2.5+

$$\text{i) } X(s) = \frac{2s+4}{s^2+4s+3}, \text{ Re}(s) > -1$$

$$\text{ii) } X(s) = \frac{2s+4}{s^2+4s+3}, \text{ Re}(s) < -3$$

2.5

$e^{\lambda(x)}$

**Noakhali Science and Technology University**

**Department of Computer Science and Telecommunication Engineering**

**2<sup>nd</sup> Year 2<sup>nd</sup> Term B.Sc. (Engg.)**

**Session: 2019-20**

**Final Examination- January, 2023**

**Course Code: CSTE 2207**

**Course Title: Electronic Communication**

**Time: 4 hours.**

**Total Marks: 70**

**[Answer any seven of the following questions. Figures in the right hand margin indicate full marks]**

1. a) Discuss the various form of data or message representation. 4  
 b) Explain the types of transmission media. 4  
 c) If you need to download text documents at a rate of 100 pages per second. A page containing 24 lines in average. Each line contains approximately 80 characters and each character requires 8 bits. Calculate the required bit rate of the channel? 2
2. a) Differentiate 3G and 4G from the evolution of telecommunication. 3  
 b) Draw a figure internetwork contains LAN and WAN. 2  
 c) Compare between circuit switch and packet switched network. 2  
 d) What is datagram? Write the features of transport layer for TCP/IP model. 1+2
3. a) Show the relationship between the probability of occurrence for the frequent letter 'e' and non-frequent letter 'q' and find out the required information relationship as well. If the channel capacity (bps) is fixed, then show the relationship of the required time to transmit 'e' and 'q'. 3  
 b) An information source generates four messages  $m_1, m_2, m_3, m_4$  with probabilities:  $\frac{1}{2}, \frac{1}{8}, \frac{1}{8}, \frac{1}{4}$  respectively. Calculate the entropy of the system. 3  
 c) For the given symbol and probability analyze the Huffman source coding. 4
- | Symbol      | $S_0$ | $S_1$ | $S_2$ | $S_3$ | $S_4$ | $S_5$  | $S_6$  |
|-------------|-------|-------|-------|-------|-------|--------|--------|
| Probability | 0.25  | 0.25  | 0.125 | 0.125 | 0.125 | 0.0625 | 0.0625 |
4. a) Derive the Hertley-Nyquest error free coding theorem. From this, how Shannon derive the noisy-channel coding theorem and established his (Shannon's) channel capacity? 6  
 b) Consider an extremely noisy channel in which the value of the signal-to-noise ratio is almost zero. In other words, the noise is so strong that the signal is faint. For this channel what will be the capacity? 2  
 c) Discuss Shannon's entropy. 2
5. a) Lists the type of connection that can be established in a telecommunication network. 2  
 b) Draw a multistage switch and show a connecting path on that switch. 2  
 c) If narrow band voice frequency ranges from 300 to 3400 Hz. Calculate signal bandwidth. Then how much bandwidth allocated for a single voice-frequency transmission channel including guard bands? And what will be the sampling rate for pulse code modulation system used for digital PSTN? 3  
 d) Draw the functional block diagram of a standard telephone set. 2
6. a) Discuss the subscriber loop line for telephone network. 3  
 b) Contrast between space division and time division switch. 2  
 c) How the dual tone multiple frequency signaling mechanism related to the touch tone dial telephone? 2  
 d) Construct how your cell phone number match with the systematic way of international telephone number structure. 3

- 7✓ a) What do you understand by sideband frequencies in an AM wave? 2  
 b) Explain amplitude modulation. Derive the voltage equation of an AM wave. 3  
 c) An audio signal of 1 KHz to 4 KHz is used to amplitude modulate a carrier of 500KHz. 5  
 Determine i) sidebands and ii) total bandwidth. 2b  
*Sc-sm Sc-sm*
8. a) Justify the choice of 625 lines for TV transmission. Why the total number of lines kept odd in all television systems? What is the significance of choosing the number of lines as 625 and not 623 or 627? 5  
 b) What is flicker in TV system? Explain how to minimize or remove flicker in picture. 3  
 c) State the working principle of color TV transmission system. 2
9. a) Compare PAM and AM continuous wave modulation. 2  
 b) Write down the applications of PWM. 3  
 c) Show how to generate PDM and PPM. 5

$$B \log_2 \left( 1 + \frac{S}{N} \right)$$

Noakhali Science and Technology University

Department of Computer Science and Telecommunication Engineering

2<sup>nd</sup> Year 2<sup>nd</sup> Term B.Sc. (Engg.) Session: 2019-20 Final Examination – January, 2022

Course Code: CSTE 2203

Course Title: Digital Electronics and Pulse Techniques

Time: 3 hours.

Total Marks: 70

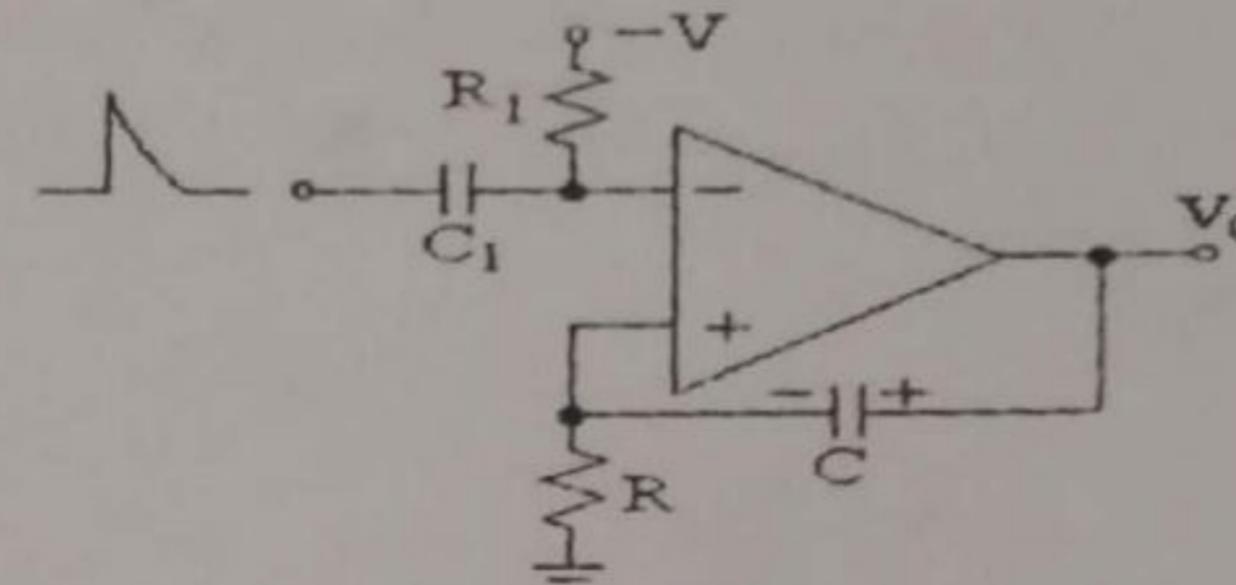
[Answer any seven of the following questions. Figures in the right-hand margin indicate full marks]

1. a) By using a 555 IC, design an Astable multivibrator to oscillate at the frequency of 50KHz, duty cycle 63% 5

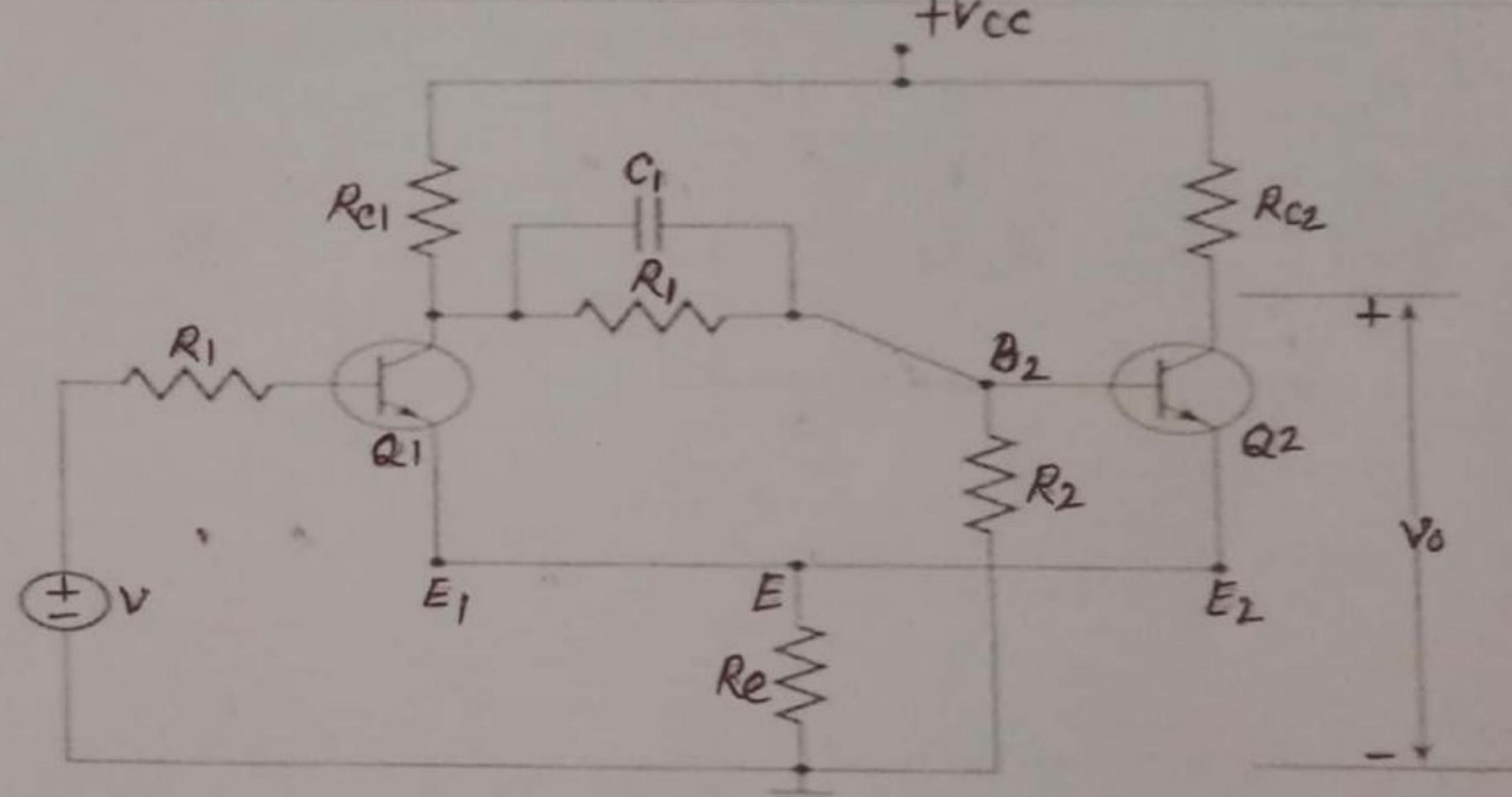
- b) Draw and explain the internal diagram of a Voltage Controlled Oscillator (VCO) by using 555 IC. 5

2. a) Design an Astable multivibrator using NPN transistors to oscillate at the frequency of 100KHz. 5

- b) Explain the Monostable circuit shown here. 5



3. a) Explain the Schmitt trigger circuit shown here. 5



- b) Draw and explain the internal diagram of a TTL NAND gate. 5

4. a) Compare the properties of open collector TTL NAND gate with those of Totem-pole TTL NAND gate. 5

- b) Why the Totem-pole output of TTL NAND gate cannot be tied together? 5

5. a) By using an UJT, design a relaxation oscillator to oscillate at the frequency of 200KHz (approximately). the intrinsic stand-off ratio=0.6 5

- b) Explain the static emitter characteristic curve of UJT. 5

6. a) What is fan-out of logic gate? Draw the logic circuit of fan-out 3 with two inputs NAND gates. 3

- b) Compare the Current-Sourcing and Current-Sinking capabilities between two input NOR gates where one gate is working as driving gate and other working as a load gate. Show these operations with suitable logic circuits. 4

- c) Write the cut-off characteristics of a PNP Transistor switch with circuit diagram. 3

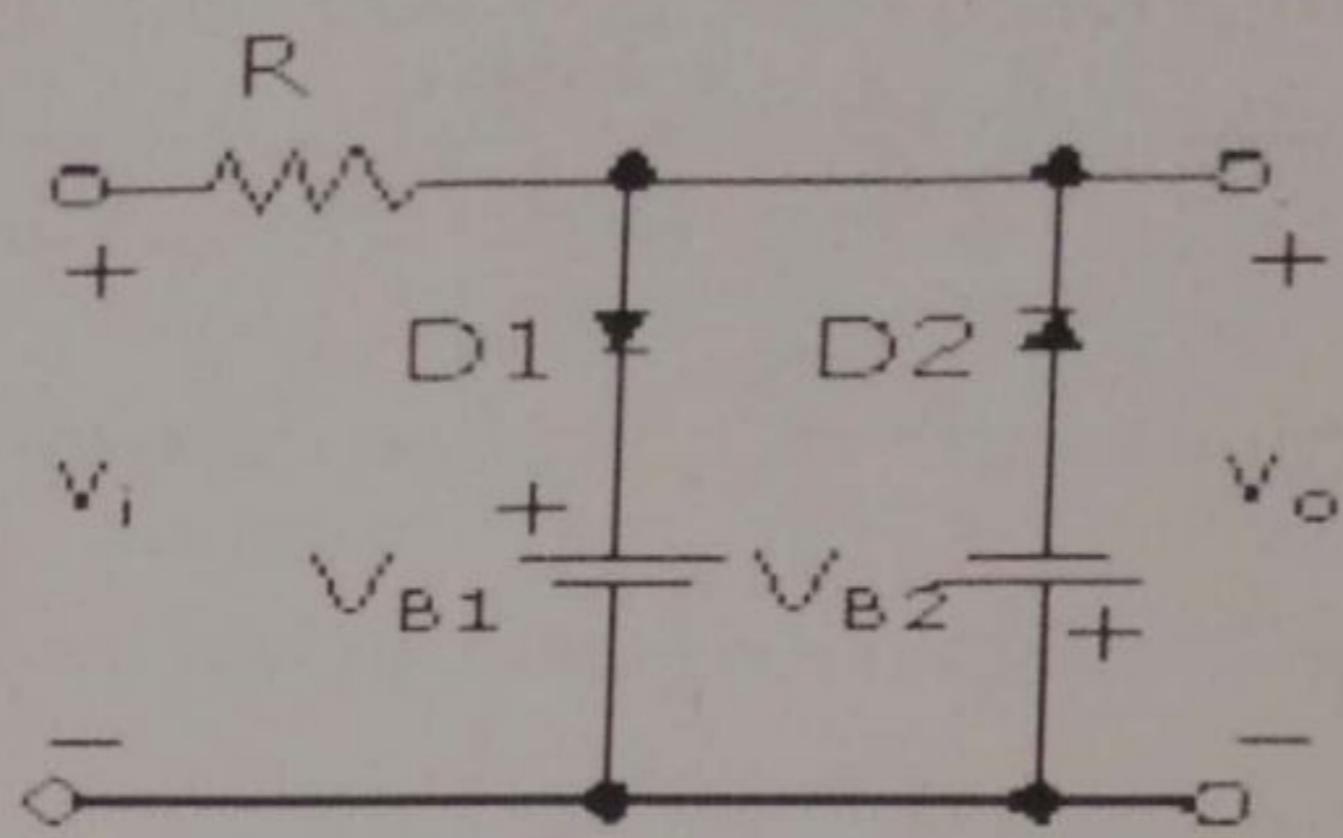
7. a) Design 16kx8 EEPROM and deduce with truth-table. 5

- b) Design a 32x8 RAM combining two 16x4 RAMs and derive operations. 5

8. a) Show the comparison between Clipper and Clamper circuits with appropriate figures 4

- b) Design two simple clipper circuit when diode and resistor are interchanged and explain their operations. 4

- c) If  $V_i=50V$  P-P;  $V_{B1}=15V$  and  $V_{B2}=15V$  of the following figure. Draw the output voltage  $V_o$  with appropriate figure and explain the circuit operations. 2



- 9/ a) By using an Op-Amp, design a relaxation oscillator to oscillate at the frequency of 10KHz  
 b) Draw the charging and discharging waveforms the capacitor used in the relaxation oscillator by Op-amp.

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Department of Computer Science and Telecommunication Engineering

2<sup>nd</sup> Year 2<sup>nd</sup> Term B.Sc. (Engg.) Session: 2019-20 Examination- January, 2022

Course Code: CSTE 2209

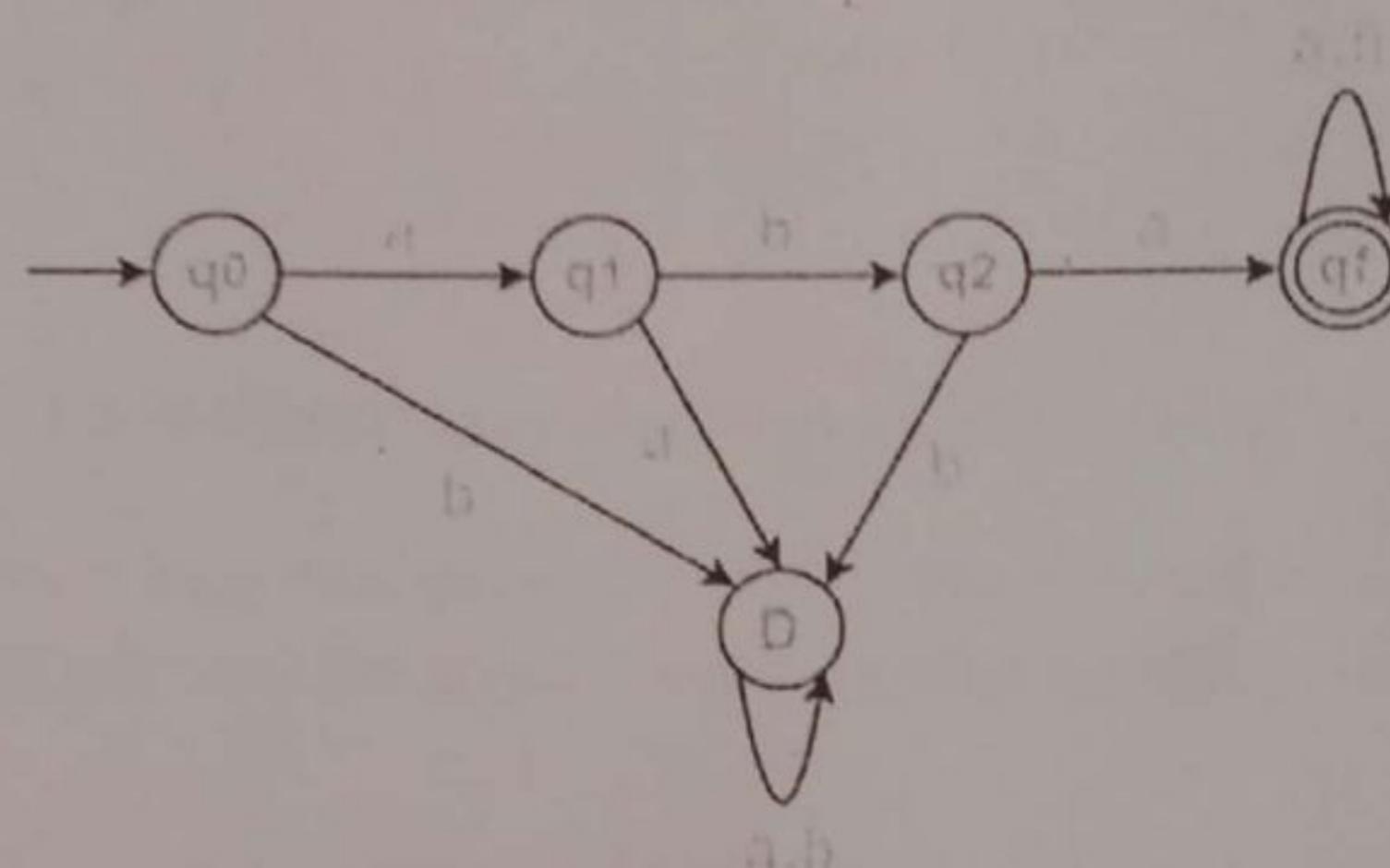
Course Title: Theory of Computation

Time: 4 hours.

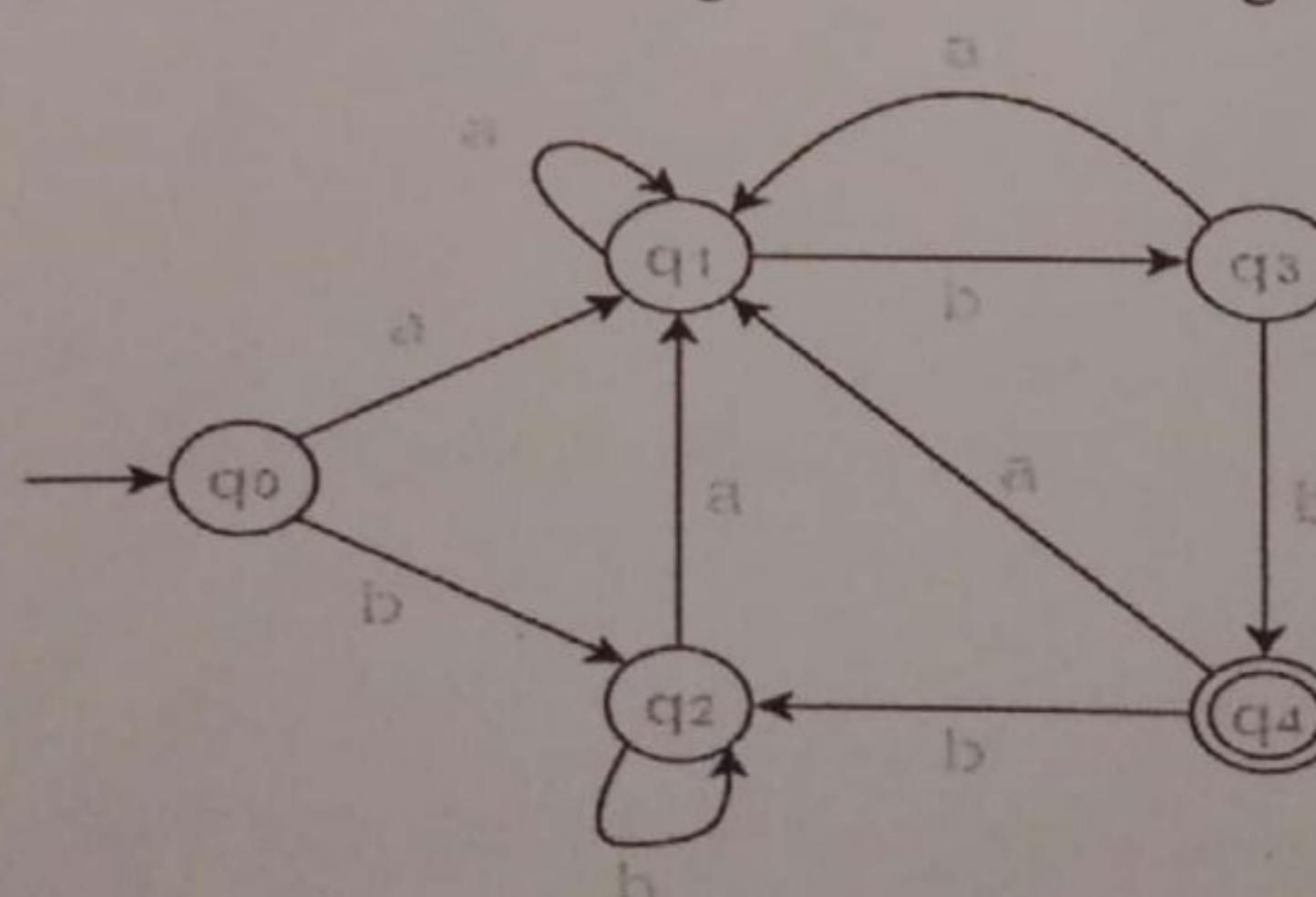
Total Marks: 70

[Answer any seven of the following questions. Figures in the right hand margin indicate full marks]

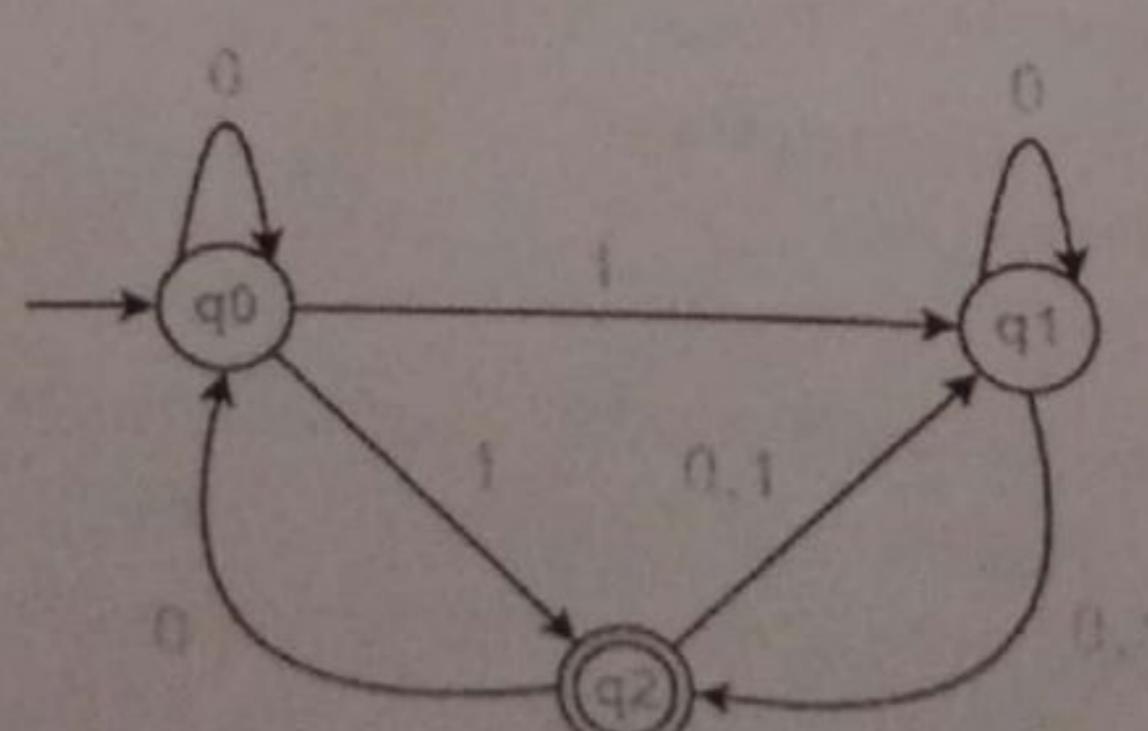
1. a) What do you mean by theory of computation? Discuss about the three major branches of it. 1+3
- b) Show the comparisons among theorem, lemma and corollary with examples. "More flexible memory results to the solution of more computational problems"- justify this statement with appropriate diagrams. 2+2
- c) Define proof by counter-example? Proof that  $(\epsilon, w) \subseteq [\text{suffix}(w) \cap \text{prefix}(w)]$ , where  $w = abc$ . 2
2. a) Write down the languages of a DFA and an NFA. Consider the following DFA and show how to process a string ***ababba*** using extended transition function ( $\hat{\delta}$ ). 2+2



- b) Draw a DFA for the following languages over  $\Sigma = \{a, b, c\}$ : 2+2
- (i) The set of all strings ending in ***cab***
  - (ii) The set of all strings starting with ***c*** and ending with ***b***
- c) Differentiate between mealy machine and moore machine with examples. 2
3. a) Show the DFA minimization for the following automaton using equivalence theorem: 4



- b) Show the conversion of DFA for the following NFA using subset construction: 4



- c) What do you mean by epsilon-closure? What are the uses of  $\epsilon$ -transitions? 2

4. a) What is a regular expression? Write regular expressions for the following language: 5  
 (i) The set of strings over alphabet {0, 1} that consists equal number of 0's and 1's such that no prefix has two more 0's than 1's, nor two more 1's than 0's.  
 (ii) The set of strings over alphabet {a, b, c} containing at least one a and at least one b.
- b) Write regular set for the following regular expressions: (i)  $(0+010)^*$  (ii)  $(ab)^*(bb)^*b$  2  
 c) An address starts with a capital letter followed by zero or more lower-case letter. It may have one or more word in its name. The address must include house number as part of the address. Most house numbers start with digits and it may have letter as following "123A Main St.". Write a regular expression to represent these kinds of address in UNIX notation. 3
5. a) Prove that "If  $L=L(A)$  for some DFA  $A$ , then there is a regular expression  $R$  such that  $L=L(R)$ ". 4
- b) Define Arden's theorem. Show the RE for the following DFA using state-elimination technique: 1+3
- P + R  
 PR  
 P\*  
 P\* (A\* + AB)\* R  
 P\* (A\* + AB)\* R  
 P\* (A\* + AB)\* R  
 P\* (A\* + AB)\* R*
- |                  |   |   |
|------------------|---|---|
|                  | 0 | 1 |
| $\rightarrow *p$ | s | p |
| $q$              | p | s |
| $r$              | r | q |
| $s$              | q | r |
- aab  
 123A Main St.  
 S -> AAB + AB  
 A -> aA + C  
 B -> bB + C  
 2 B/0  
 0A1/01  
 3 /0C2/1P2  
 3 P/0*
- c) Why pumping lemma is required? Write down the properties of pumping lemma.
6. a) Differentiate between ambiguity and inherent ambiguity with examples. 5  
 b) Consider the following grammar and show a derivation tree for the string  $a + b^*c$ :  
 $E \rightarrow E+E \mid E^*E \mid a \mid b \mid c$
- Then prove that the grammar is an ambiguous grammar and show how to eliminate ambiguity from the grammar.
- c) Write down the language of a Pushdown Automata (PDA). Design a PDA to accept a language  $L = \{a^i b^j c^k \mid i, j, k \geq 0 \text{ and } i + k = j\}$ . 1+3
7. a) What is derivative tree? Let the grammar  $G = (\{S, A\}, \{a, b\}, P, S)$ . Where P consists of 1+4  
 $S \rightarrow AC \mid B$   
 $A \rightarrow a$   
 $C \rightarrow c \mid BC$   
 $E \rightarrow aA \mid e$
- Find an equivalent reduced grammar.
- P = Q + QP*
- b) Let the grammar  $G = (\{S, A, B\}, \{a, b\}, P, S)$ . Where P consists of 5  
 $S \rightarrow bA \mid aB$   
 $A \rightarrow bAA \mid aS \mid a$   
 $B \rightarrow aBB \mid bS \mid b$
- Find an equivalent grammar in Chomsky Normal Form (CNF).
- G( q\_0, w )*
8. a) What is Turing Machine? Describe the formal notations of TM in finite automata. 1+2  
 b) What is Fermat's Last theorem? Design a Turing Machine that takes as input a number N and adds 1 to it in binary. *its complement* 1+4  
 c) What is partial recursive function? 2
9. a) Show the coding rules for the universal turing machine? Differentiate between recursive language and recursively enumerable language. 2+2  
 b) What is the halting problem and the post correspondence problem? Why they are known as undecidable problems? Explain. 2+2  
 c) Illustrate  $P$ ,  $NP$ ,  $NP$ -hard, and  $NP$ -complete classes. 2

5

2  
3

4

1+3

2 B/0  
0A1/01  
3 /0C2/1P2  
3 P/0

5

2

2+2

2+2

2

Noakhali Science and Technology University

Department of Computer Science and Telecommunication Engineering

2<sup>nd</sup> Year 2<sup>nd</sup> Term B.Sc. (Engg.)

Session: 2019-20

Final Examination- January, 2023

Course Code: CSTE 2211

Course Title: Electromagnetic Waves and Radiating Systems

Time: 3 hours.

Total Marks: 70

[Answer any seven of the following questions. Figures in the right hand margin indicate full marks]

1. a) Draw the cross sectional diagram of TE<sub>01</sub>, TE<sub>02</sub>, TM<sub>01</sub> mode in circular waveguide and compare among them. 3+4
- b) Contrast between guide wavelength and free space wavelength. 3
2. a) The electric field of a medium is given as  $E = x^2 y i + (x + 1)z^2 k$ , calculate the magnetic field at point (2,1,1). 5
- b) Calculate the tangential component of the E and H. Calculate also reflection coefficient for an electromagnetic wave reflected by a perfect dielectric. Consider that the wave incident normally on the dielectric. 5
3. a) Using Maxwell 3<sup>rd</sup> equation, calculate the component of magnetic field when the component of electric field is  $E_x = E_0 e^{-i\omega t + \beta z}$ , here the symbols are usual meaning. 4
- b) From question 3(a), calculate intrinsic impedance also. What will be intrinsic impedance in free space? 2+1
- c) The electric field inside a rectangular box is  $E = x^2 i + (y + 1)j + z^2 k$ , calculate total charge inside the box when the dimension of the box is  $4 \times 4 \times 9 \text{ cm}^3$ . 3
4. a) Interpret the transmission line equation and derive the general solution in Laplace transform's domain. 7
- b) State the propagation constant for series impedance and shunt impedance of line per unit length. 3
5. a) What do you mean by phase velocity? If the relative permittivity of a dielectric medium is 1.46, what is refractive index? 4
- b) What will be the phase velocity of an electromagnetic wave of frequency 225kHz when it penetrates in sea water of conductivity  $\sigma = 10^{-3} \text{ mho/m}$ . 2
- c) What is skin depth? Calculate the penetration depth of a one-megahertz wave into copper which has conductivity  $\sigma = 5.8 \times 10^7 \text{ mhos per meter}$  and permeability approximately equal to that of free space. 4
6. a) State Poynting theorem. 2
- b) A long coaxial cable consists of two concentric cylinders with radii a and b. Its central conductor carries a steady current i, the outer conductor providing the return path. Considering the transfer of energy to load resistance along the cable which has DC volt V, calculate the power using Poynting theorem. 5
- c) The power flow equation is  $\int_V \mathbf{E} \cdot \mathbf{J} dV = -\frac{\partial}{\partial t} \int_V (\frac{\mu}{2} H^2 + \frac{\epsilon}{2} E^2) dV - \oint_S \mathbf{E} \times \mathbf{H} \cdot da$ . Explain the physical significance of the equation. 3
7. a) What is Antenna? Why is it necessary? Write down radiation mechanism of Antenna. 4
- b) Write down the construction and working principle of Yagi Uda Antenna. Draw also radiation pattern of the Antenna. 4+2
8. a) Design a folded dipole antenna when the transmission line impedance is  $300 \Omega$ . 7
- b) Write the features of dipole antenna. 3
9. a) What do you mean by wave polarization? 2
- b) Derive the condition for linear, elliptically and circular polarization. 5
- c) The interior of a  $20/3 \text{ cm} \times 20/4 \text{ cm}$  rectangular waveguide is completely filled with a dielectric of  $\epsilon_r = 4$ . Calculate the cutoff frequency and wavelength in the TE<sub>11</sub> mode. 3

Refractive index  
 $\sqrt{\epsilon_r + \mu_r}$   
 $e^{(j\omega t - \beta z)}$

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Department of Computer Science and Telecommunication Engineering

2<sup>nd</sup> Year 2<sup>nd</sup> Term B.Sc. (Engg.)

Session: 2019-20

Final Examination- January, 2023

Course Code: MATH 2207

Course Title: Complex variable, Statistics and Probability

Time: 4 hours.

Total Marks: 70

[Answer any seven of the following questions. Figures in the right hand margin indicate full marks]

1. a) Determine the set of points in the complex plane which satisfy the inequality  $|z - i| \leq |z + i|$  and sketch it. 5

- b) Describe geometrically the region of the following 5

$$\frac{|z - 3|}{|z + 3|} = 2$$

2. a) Show that the function  $f(z) = \begin{cases} \frac{x^3 y^4 (x+iy)}{x^8+y^8} & \text{when } z \neq 0 \\ 0 & \text{when } z = 0 \end{cases}$  the Cauchy-Riemann equations are satisfied at origin, but  $f(z)$  is not analytic there. 5

- b) For the function,  $f(z)$  defined by  $f(z) = \begin{cases} \frac{(z)^2}{z} & \text{when } z \neq 0 \\ 0 & \text{when } z = 0 \end{cases}$  Show that the C-R equations are satisfied at  $(0,0)$  but the function is not differentiable at  $0+i0$ . 5

3. a) Using Cauchy's integral formula, evaluate  $\int_C \frac{z dz}{(9-z^2)(z+i)}$ , where  $C$  is the circle  $|z|=2$  described in the positive sense. 5

- b) Show that  $\frac{1}{2\pi i} \oint_C \frac{e^z}{(z^2+\pi^2)} dz = \frac{1}{\pi}$ , where  $C$  is the circle  $|z|=4$ . 5

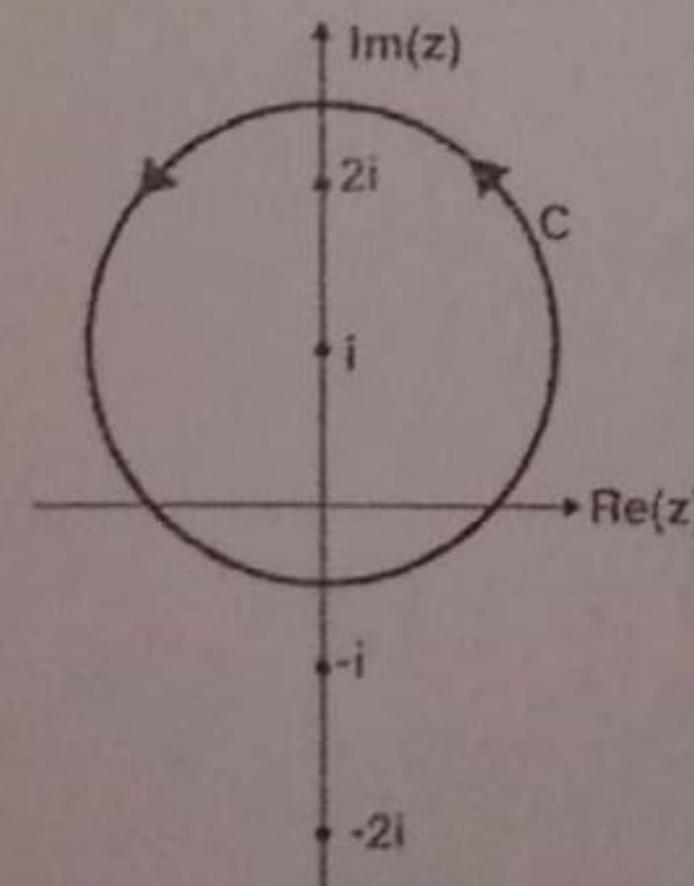
4. a) Define skewness and Kurtosis of a distribution? 3

- b) How do you know if skewness and kurtosis are normally distributed? Explain with proper examples. 3

- c) Karl Pearson's coefficient of skewness of a distribution is 0.32, its S.D is 6.5 and mean is 29.6. Find out the mode and median of the distribution. 4

5. a) Find the residues of the function  $f(z) = \frac{z^2-2z}{(z+1)^2(z^2+4)}$  5

- b) Evaluate  $\int_C \frac{1}{(z^2+4)^2} dz$  over the contour, as shown in the below figure. 5



6. a) What do you mean by random variable? Explain it with example. 3
- b) Distinguish between probability density function and probability mass function with example. 3

$$-\frac{e^{-x} \pi - i + i + e^{-2}}{4\pi^3}$$

- c) In a continuous distribution whose relative frequency density is given  $f(x) = y_0 x(2-x)$ ,  $0 \leq x \leq 2$ , 4

Find the mean, variance,  $\beta_1$ ,  $\beta_2$  and hence show that the distribution is symmetrical.

- 7/ a) Distinguish between Binomial and Poisson distribution. 3

- b) A and B play a game in which their chances of winning are in the ratio 5:2. Find A's chance of winning at least three games out of six games played. 3

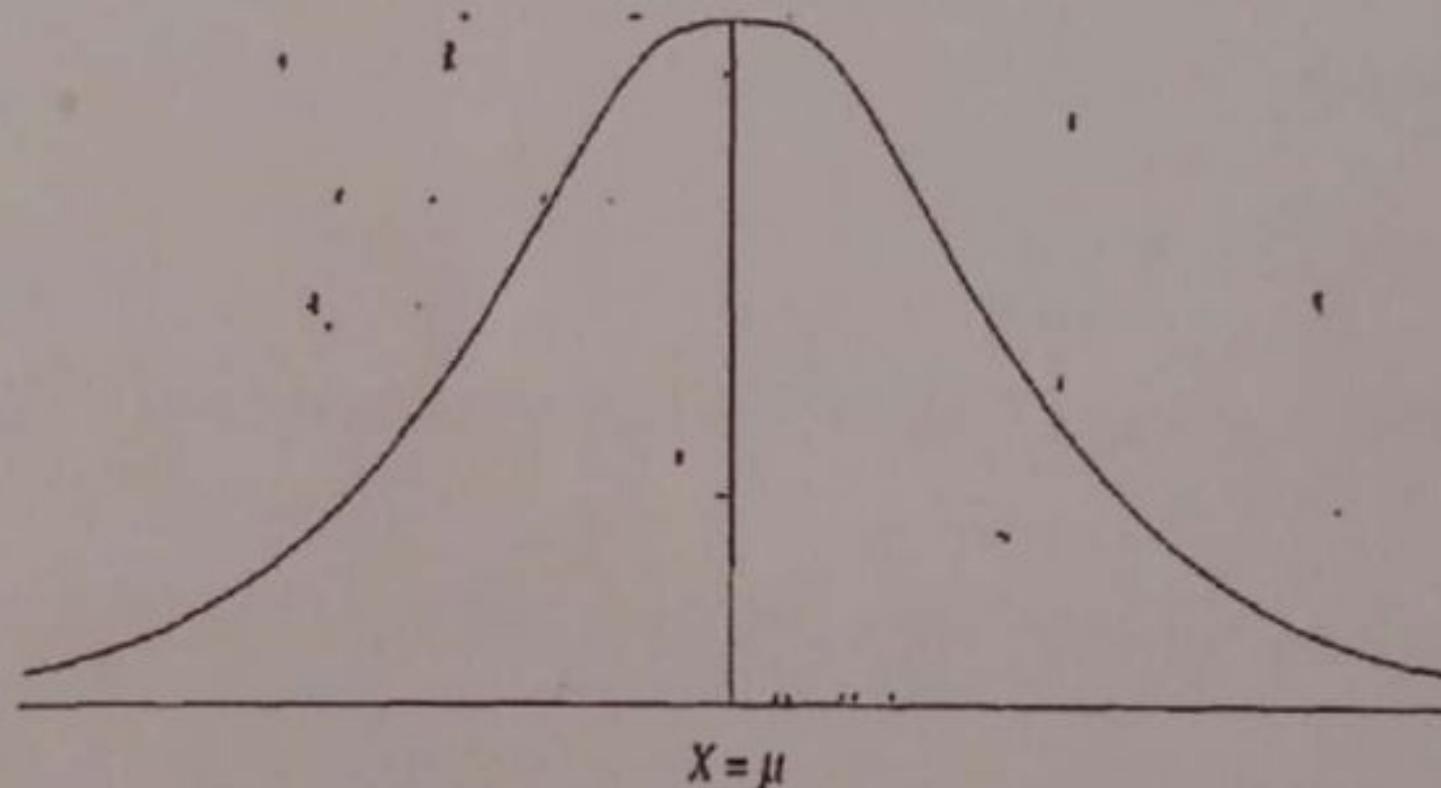
- c) A random variable  $x$  has the following probability distribution: 4

|              |   |    |    |    |    |     |     |     |     |
|--------------|---|----|----|----|----|-----|-----|-----|-----|
| Value of $x$ | 0 | 1  | 2  | 3  | 4  | 5   | 6   | 7   | 8   |
| P( $x$ )     | a | 3a | 5a | 7a | 9a | 11a | 13a | 15a | 17a |

Determine the value of a. Also find  $P(0 < x < 5)$ .

8. a) Define normal distribution and standard normal distribution. 3

- b) Write down the properties of the following curve- 4



For the value of  $\beta_1 > 0$  and  $\beta_2 > 3$ , redrawn the curve and explain it.

- c) Describe the area property of normal distribution. 3

9. a) Define Linear and nonlinear regression with examples. 3

- b) How do you determine linear or nonlinear regression to apply in the target analysis? Explain with proper examples. 3

- c) Consider the following set of points:  $\{(-2, -1), (1, 1), (3, 2)\}$

i) Find the least square regression line for the given data points.

ii) Plot the given points and the regression line in the same rectangular system of axes.

4 Ans

$$(z-i)^2 = (z-i)(\bar{z}-i)$$

$$(z-i)^2 = (z-i)(\bar{z}-i) = z\bar{z} - zi - \bar{z}i$$

$$\sum (z-i)^2 = \sum (z\bar{z} - zi - \bar{z}i) = \sum z\bar{z} - \sum zi - \sum \bar{z}i$$

$$\sum (z-i)^2 = \sum z\bar{z} - \sum zi - \sum \bar{z}i$$

$$\sum (z-i)^2 = \sum z\bar{z} - \sum zi - \sum \bar{z}i$$

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