

## Are EVMs Hackable?

### Context:

- The **Supreme Court** issued notice to the **Election Commission of India (ECI)** on a writ petition seeking a direction to **mandatorily cross-verify the count in Electronic Voting Machines (EVMs)** with votes verifiably recorded as cast by counting all **Voter Verifiable Paper Audit Trail (VVPAT) slips**.
- **General elections** will be held in India from **19 April 2024** to **1 June 2024** to elect the **543 members of the 18th Lok Sabha**.

### 1. What is an EVM?

- **Electronic Voting Machine (EVM)** was introduced in **India in 1982** to allow the citizens to vote electronically and ease the job of the Election Commission of India in counting the votes.
- It was first used in the **Paravur Assembly Constituency of Kerala** in the year **1982**.
- These EVMs have been designed by the **Election Commission's Technical Expert Committee (TEC)** in collaboration with two PSUs, **Bharat Electronics Limited, Bangalore** and **Electronic Corporation of India Limited, Hyderabad**.
- **In 2003, all state elections and by-elections** were held using EVMs.

### Features of EVM:

- It comprises **two units - control unit and balloting unit**. They are connected by a 5-meter cable.

- The EVM runs on a **6-volt single alkaline battery** fixed in the control unit.
- It can even be used in **areas that have no electricity**.
- The **control unit** is with the Election Commission selected **polling officer**.
- These EVMs have been **designed by the Election Commission's Technical Expert Committee (TEC)** in conjunction with two PSUs, **Bharat Electronics Limited, Bangalore and Electronic Corporation of India Limited, Hyderabad**.
- The **M2 EVMs** can cater to a **maximum of 64 candidates** including **NOTA**.
- There is provision for **16 candidates in a Balloting Unit**. If the total number of candidates exceeds 16, more balloting units can be attached up to a maximum of 64 candidates by connecting 4 Balloting Units.
- The software part is discussed below:

### What is 'source code'?

- The source code is a set of instructions in human readable language written by programmers. It provides the foundation for software and programme for the EVM. The source code tells the machine how to function.

### How it is designed?

- The crucial job of designing the source code and writing the software is carried out by a group of handpicked employees of the two public sector enterprises, **Bharat Electronics Limited and Electronics Corporation of India Limited** which also manufacture the EVMs. Both the PSUs are not under the control of the ECI. BEL is under the Ministry of Defence and ECIL reports to the Department of Atomic Energy. According to the "Status Paper on EVMs", The software of EVMs is developed in house by a selected group of engineers at BEL and ECIL independently from each other. This select software

development group of few engineers design and develop the source code.

### **What is the role of Technical Evaluation Committees?**

- The technical advice is given by the Technical Evaluation Committees (TECs). The Status Paper on EVMs does not spell out if the source code is shared with the TEC. Entire software is vetted by the TEC and sealed by them. Golden copy [the original copy, which is meaningless unless one knows the code for writing the copy remains under sealed condition only. This ensures that the software has really been written as per the requirements laid down for its intended use only.

### **Does the ECI have access to the software?**

- The ECI does **not** even have access to the software that is loaded onto the EVMs. That right rests solely with the manufacturer and technical experts.

### **What is the chip or the microcontroller which is used in EVM?**

- The microchip used in EVMs is a one-time programmable/ masked chip, which can neither be read nor overwritten. Hence, the program used in the EVMs cannot be reprogrammed in a particular manner. Blank chips are imported by BEL and ECIL. The source code is developed and programmed by them and coded on to the EVM chip – a special security microcontroller. Each chip or EVM would typically go through a minimum of 70-80 tests before deployment. In the new M3 EVM machine, the source code is also verified by the TEC (Technical Expert Committee) to ensure that the same source code binary is put in the micro controllers

Models of EVM:



**Metamorphosis**

» **M1 (Model 1)**  
 EVMs manufactured between 1989 and 2006. Last used in the 2014 general elections, these machines have been phased out. No M1 machine was used in the recent assembly elections in five states

**Present Inventory**  
**9.2 lakh** (including BU, CU) were manufactured till 2006  
 About **1.4 lakh** destroyed so far

» **M2**  
 EVMs manufactured between 2006 and 2012

**Present Inventory**  
 Ballot Unit: **5.57 lakh**  
 Control Unit: **5.3 lakh**  
 Real-time clock and dynamic coding were the two major features added to this device

» **M3**  
 EVMs manufactured in 2013 and later

**Present Inventory**  
 Ballot Unit: **3.4 lakh**  
 Control Unit: **3.36 lakh**  
 A tamper-proof feature was added. Even if a screw is removed, the device stops functioning

Source: ECI

Presently, the M3 Model of ECI-EVM and VVPAT are used in elections.

## 2.Can EVMs be hacked?

The EVM's cannot be hacked due to the reasons given below:

<p><b>M1 (model one) of EVM machines</b></p>	<ul style="list-style-type: none"> <li>● <b>M1 (model one) of EVM machines were manufactured till 2006 and had all necessary technical features making M1 non-hackable contrary to claims made by some activists.</b></li> </ul>
<p><b>M2 model of EVMs</b></p>	<ul style="list-style-type: none"> <li>● <b>On the recommendations of the Technical Evaluation Committee in 2006, M2 model of EVMs produced after 2006 and upto 2012 incorporated with dynamic coding of key codes thereby enabling transfer of the key - press message from Ballot Unit (BUs) to Control Unit (CUs), in an encrypted form as an additional security feature.</b></li> </ul>
<p><b>Tamper detection and self-diagnostics</b></p>	<ul style="list-style-type: none"> <li>● <b>The new model M3 EVMs also have tamper detection and self-diagnostics as added features. Since, software is based on OTP the program cannot be altered, rewritten or Re-read. Thus, making EVM tamper proof.</b></li> <li>● <b>If anyone make, attempt, the machine will become inoperative.</b></li> </ul>
<p><b>Real time settings</b></p>	<ul style="list-style-type: none"> <li>● <b>It also contains Real time settings of each key press so that sequencing of key presses including so called malicious sequenced key presses can be detected and wrapped.</b></li> </ul>
<p><b>ECI- EVMs are not computer controlled</b></p>	<ul style="list-style-type: none"> <li>● <b>The ECI- EVMs are not computer controlled, are stand alone machines and not connected to the internet and /or any other network at any point of time.</b></li> <li>● <b>Hence, there is no chance of hacking by remote devices.</b></li> </ul>

<p><b>ECI-EVMs do not have any frequency receiver or decoder for data</b></p>	<ul style="list-style-type: none"> <li>● <b>The ECI-EVMs do not have any frequency receiver or decoder</b> for data for wireless or any external hardware port for connection to any other non-EVM accessory or device.</li> <li>● Hence <b>no tampering is possible either through hardware port or through Wireless, Wi-Fi or Bluetooth device</b> because <b>CU accepts only encrypted and dynamically coded data from BU.</b></li> <li>● No other kind of data can be accepted by CU.</li> </ul>
<p><b>Very stringent security protocol</b></p>	<ul style="list-style-type: none"> <li>● There is very stringent security protocol at manufacturer level <b>regarding security of software.</b></li> <li>● The manufacturers <b>are in no position</b> to know several years ahead which candidate will be contesting from a particular constituency and what will be the sequence of the candidates on the BU.</li> <li>● Also, <b>each ECI-EVM has a serial number</b> and the Election Commission by use of EVM -tracking software can find out from its database which machine is located where.</li> <li>● So, <b>any manipulation at the manufacturing stage is ruled out.</b></li> </ul>
<p><b>Most sophisticated technological features</b></p>	<ul style="list-style-type: none"> <li>● The ECI-EVMs use some of the most sophisticated technological features like <b>one time programmable (OTP) microcontrollers, dynamic coding of key codes, date and time stamping of each and every key press,</b> advanced encryption technology and EVM-tracking software to handle EVM logistics, among others to make the machine 100% tamper proof.</li> </ul>



### 3.What is the view of the Supreme Court on EVM?



- **The Supreme Court** dismissed the petition alleging irregularities in the function of EVMs, citing, ‘**Can't go by assumptions**’.
- In a **2013 Subramanian Swamy V/s ECI** case, the **Supreme Court** emphasized the necessity of **implementing VVPAT** in elections conducted through **EVMs**.

### 4.What are the advantages and disadvantages of EVM?

Advantages	Disadvantages
<p><b>Right to vote:</b></p> <ul style="list-style-type: none"> <li>● The right to vote is the supreme <b>right of democracy</b> which is being executed through the EVMs.</li> <li>● It is the constitutional duty and the responsibility of the Election Commission and the Central government to introduce such a transparent system of voting and counting</li> </ul>	<p><b>No certification:</b></p> <ul style="list-style-type: none"> <li>● No nationally or internationally recognised institutions or governments have certified the EVMs as cent per cent accurate.</li> <li>● Many software programmers have claimed that the electronic voting machines are vulnerable to malicious programming.</li> </ul>

<p>in the elections which can be evaluated by the public, the voters, themselves.</p> <ul style="list-style-type: none"> <li>• Despite this fact, by conducting polling using the machines in India, which is the biggest democracy in the world, the constitutional right to vote is being violated.</li> </ul> <p><b>Difficult for the hackers to hack:</b></p> <ul style="list-style-type: none"> <li>• In most of the advanced versions of electronic voting machines, <b>there are no external communication paths which make it difficult for the hackers to hack the machine and tamper the count numbers.</b></li> </ul> <p><b>Electronic voting machines are cost effective and environmentally friendly:</b></p> <ul style="list-style-type: none"> <li>• In the paper ballot, the <b>amount of raw material used is higher.</b></li> <li>• It <b>directly impacts the environment as paper ballots use papers to cast votes.</b></li> </ul> <p><b>Electronic voting machines are easier to carry and transport from one place to another without any hassle:</b></p> <ul style="list-style-type: none"> <li>• <b>One single machine can record several votes captured through that machine.</b></li> </ul>	<p><b>Loss of data:</b></p> <ul style="list-style-type: none"> <li>• The biggest change with technology is that no matter how much data it records, a <b>single virus can destroy the entire data storage.</b></li> </ul> <p><b>Huge cost:</b></p> <ul style="list-style-type: none"> <li>• <b>As per Election commission Rs.10,000 crore needed every 15 years for new EVMs.</b></li> </ul> <p><b>The highly humid area and those areas which receive frequent rainfall are not suitable for casting votes using electronic voting machines:</b></p> <ul style="list-style-type: none"> <li>• As machines are prone to <b>damage due to high humidity level</b>, thus usage of electronic voting machines is not advisable in such areas.</li> </ul> <p><b>Most of the electronic voting machines used in the country were foreign manufactured:</b></p> <ul style="list-style-type: none"> <li>• Secret codes that control the electronic voting machines are in foreign hands and they can be used to influence the election results.</li> </ul> <p><b>Fake votes:</b></p> <ul style="list-style-type: none"> <li>• Most of the electronic voting machines used in the country do not have any mechanism by which the <b>voter can verify</b></li> </ul>
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<ul style="list-style-type: none"> <li>● It can be used to <b>cast 2000 votes</b> at a time.</li> </ul> <p><b>Time savers:</b></p> <ul style="list-style-type: none"> <li>● <b>One can count the votes in a few minutes</b> which make life easier for the election officers on duty.</li> <li>● In a paper ballot, the vote counting process is quite tedious and time-consuming.</li> </ul>	<p><b>their identity before casting the vote</b> due to which fake voters can cast numerous fake votes.</p>
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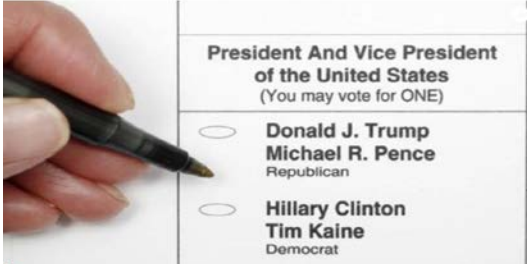
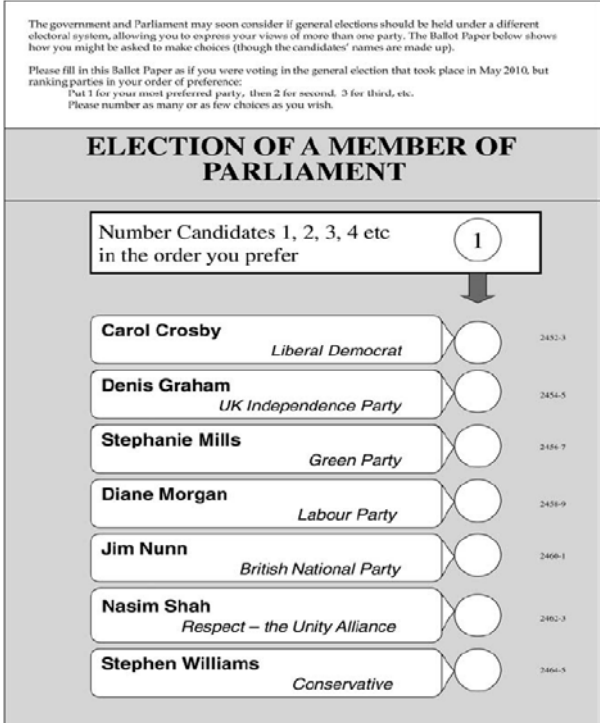
## 5.What are the electoral methods adopted in other countries?

Countries that use EVMs:

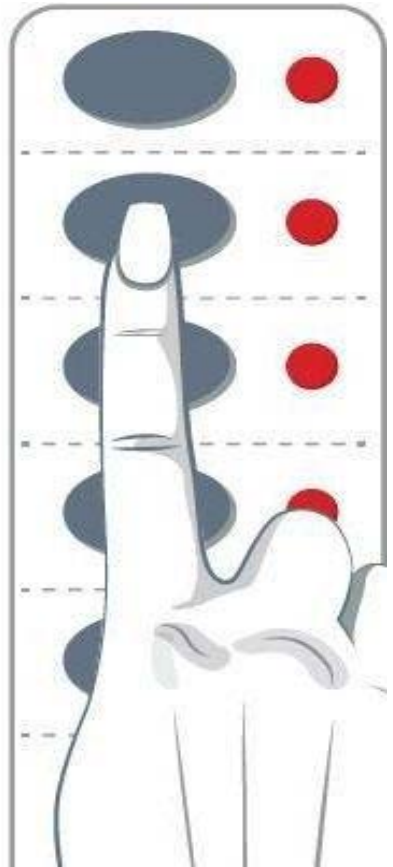
- **Electronic Voting Machines** are used in some of the world's largest democracies, including:
  1. **Belgium**
  2. **Estonia**
  3. **Venezuela**
  4. **United Arab Emirates**
  5. **Jordan**
  6. **Maldives**
  7. **Namibia**
  8. **Egypt**
  9. **Bhutan**
  10. **Nepal**
- India has given technical support related to the EVM to Jordan, Maldives, Namibia, Egypt, Bhutan, and Nepal. In these countries, **Bhutan, Nepal, and Namibia are using Electronic Voting Machines made in India.**

**Countries which have banned EVM:**

- Many countries of the world, including England, France, Germany, the Netherlands and the United States, have banned the use of EVMs due to political apprehensions.

Countries	Method adopted for Electoral Process
<p><b>USA</b></p>	<ul style="list-style-type: none"> <li>• <b>Paper Ballot</b></li> </ul>  <ul style="list-style-type: none"> <li>• The only form of e-voting in the USA is via email or fax.</li> <li>• Technically, the voter is sent a ballot form, they fill it in, return it by email, or fax a digital photo of the ballot with their choice marked.</li> </ul>
<p><b>England</b></p>	<ul style="list-style-type: none"> <li>• <b>Paper Ballot</b></li> </ul> 

Germany	<ul style="list-style-type: none"> <li>● <b>Ballot Paper</b></li> <li>● In March 2009, the Supreme Court of Germany ruled that voting through EVM was <b>unconstitutional</b>.</li> </ul>
Netherland	<ul style="list-style-type: none"> <li>● <b>Ballot Paper</b></li> <li>● In October 2006, the Netherlands banned the use of EVMs.</li> </ul>
Italy	<ul style="list-style-type: none"> <li>● <b>Ballot Paper</b></li> <li>● It has banned EVM since 2007.</li> </ul>
France	<ul style="list-style-type: none"> <li>● <b>Ballot Paper</b></li> </ul>



## 6.What is VVPAT?

VVPAT was Introduced for the **first time in India** in the **2014 Lok Sabha** elections, VVPAT or the Voter Verifiable Paper Audit Trail is basically a ballot-less vote verification system connected with the EVM.

- The SC in **Dr. Subramanian Swamy v ECI (2013)** held that VVPAT is an "indispensable requirement of free and fair elections".
- Initially introduced during the **2014 Lok Sabha** elections in India, the **Voter Verifiable Paper Audit Trail (VVPAT)** is essentially a system for verifying votes without traditional paper ballots, directly linked with the **Electronic Voting Machine (EVM)**.
- The VVPAT produces a paper slip visible to the voter, enabling them to confirm if their vote was accurately recorded on the EVM.
- This slip includes the name and symbol of the party the voter selected.

**VVPAT**  
Voter Verifiable Paper Audit Trail

VVPAT will be used in all the polling stations in the forthcoming General Elections

VVPAT will be kept in voting compartment along with Ballot Unit

VVPAT has a transparent window which shows the printed paper slip when the vote is cast

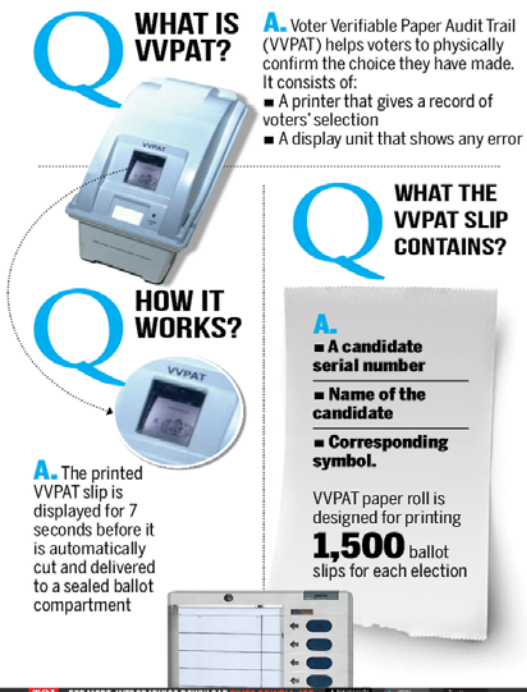
The printed paper slip will display the Name, Serial Number and Election Symbol of the candidate for seven (7) seconds to the voter

After seven (7) seconds the printed paper slip will automatically get cut and drop in the sealed box below

VVPAT further enhances transparency and reliability in poll process

**VERIFY YOUR VOTE**  
Bharat ka Bharosa

## 7. What are the advantages & challenges of VVPAT?

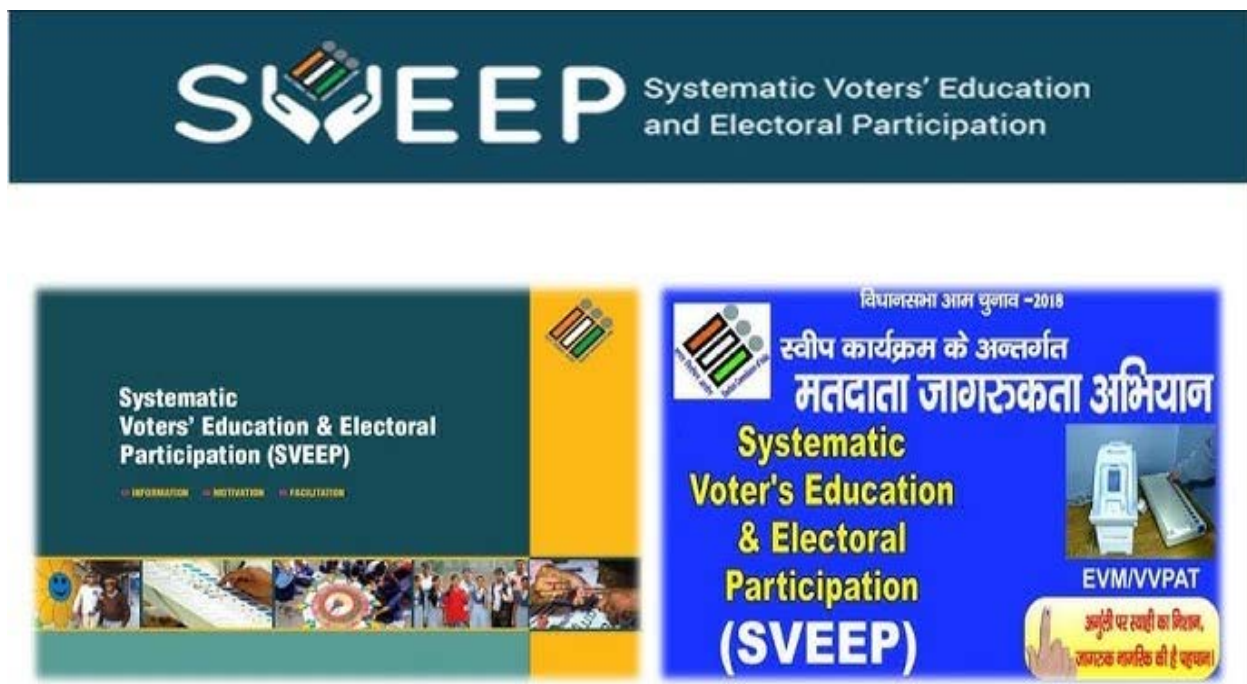
Advantages	Challenges
<p><b>Ensure transparency:</b></p> <ul style="list-style-type: none"> <li>• The <b>VVPAT produces a paper slip visible</b> to the voter, enabling them to confirm if their vote was accurately recorded on the EVM.</li> <li>• This <b>slip includes the name and symbol of the party the voter selected.</b></li> </ul>  <p>The infographic contains three sections:         <ul style="list-style-type: none"> <li><b>WHAT IS VVPAT?</b>: A. Voter Verifiable Paper Audit Trail (VVPAT) helps voters to physically confirm the choice they have made. It consists of:             <ul style="list-style-type: none"> <li>■ A printer that gives a record of voters' selection</li> <li>■ A display unit that shows any error</li> </ul> </li> <li><b>HOW IT WORKS?</b>: A. The printed VVPAT slip is displayed for 7 seconds before it is automatically cut and delivered to a sealed ballot compartment.</li> <li><b>WHAT THE VVPAT SLIP CONTAINS?</b>: A.             <ul style="list-style-type: none"> <li>■ A candidate serial number</li> <li>■ Name of the candidate</li> <li>■ Corresponding symbol.</li> </ul>             VVPAT paper roll is designed for printing <b>1,500</b> ballot slips for each election.           </li> </ul> </p>	<p><b>Technical Malfunctions:</b></p> <ul style="list-style-type: none"> <li>• One of the primary concerns with VVPAT machines is the <b>possibility of technical malfunctions.</b></li> </ul> <p><b>Light Sensitive:</b></p> <ul style="list-style-type: none"> <li>• Voter verifiable paper audit trail (VVPAT) machines are <b>light sensitive and may go off if direct sunlight falls on them for a long hour.</b></li> </ul> <p><b>High cost:</b></p> <ul style="list-style-type: none"> <li>• Expense of every EVM is between <b>Rs. 15,000 to 20,000</b> and its <b>maintenance cost is around Rs. 1000/- per year</b> which has led to a high cost of conducting elections in India</li> </ul>



## 8. What are few initiatives taken by ECI to ensure transparency in Elections?

### 1. SVEEP (Systematic Voters' Education and Electoral Participation)

- It was **launched in 2009** as the flagship program of the ECI for voter education.
- SVEEP is the **flagship program of the Election Commission of India** for voter education, **spreading voter awareness** and promoting voter literacy in India.
- It is a **multi-intervention programme that reaches out through different modes and media to educate citizens**, electors, and voters about the electoral process in order to increase their awareness and promote their informed participation.
- SVEEP is designed according to the **socio-economic, cultural, and demographic profile** of the state as well as history of electoral participation in previous rounds of elections.





## 2.C-Vigil app

- It is a **mobile application developed by the Election Commission of India (ECI)** to enable citizens to report violations of the Model Code of Conduct (MCC) during elections.
- It is a **user-friendly and easy to operate application**, which connects vigilant citizens with the District Control Room, Returning Officer and Flying Squads Teams.
- As soon as the complaint is sent on the cVigil app, the complainant will receive a unique ID through which the person will be able to track the complaint on their mobile.
- Users capture audios, photos or videos in real-time, and a **“100-minute” countdown for time-bound response to complaints is ensured.**



**C-VIGIL APP**  
SNAP, REPORT, EMPOWER

एन सी ई आर  
e-n-c-i-a-r

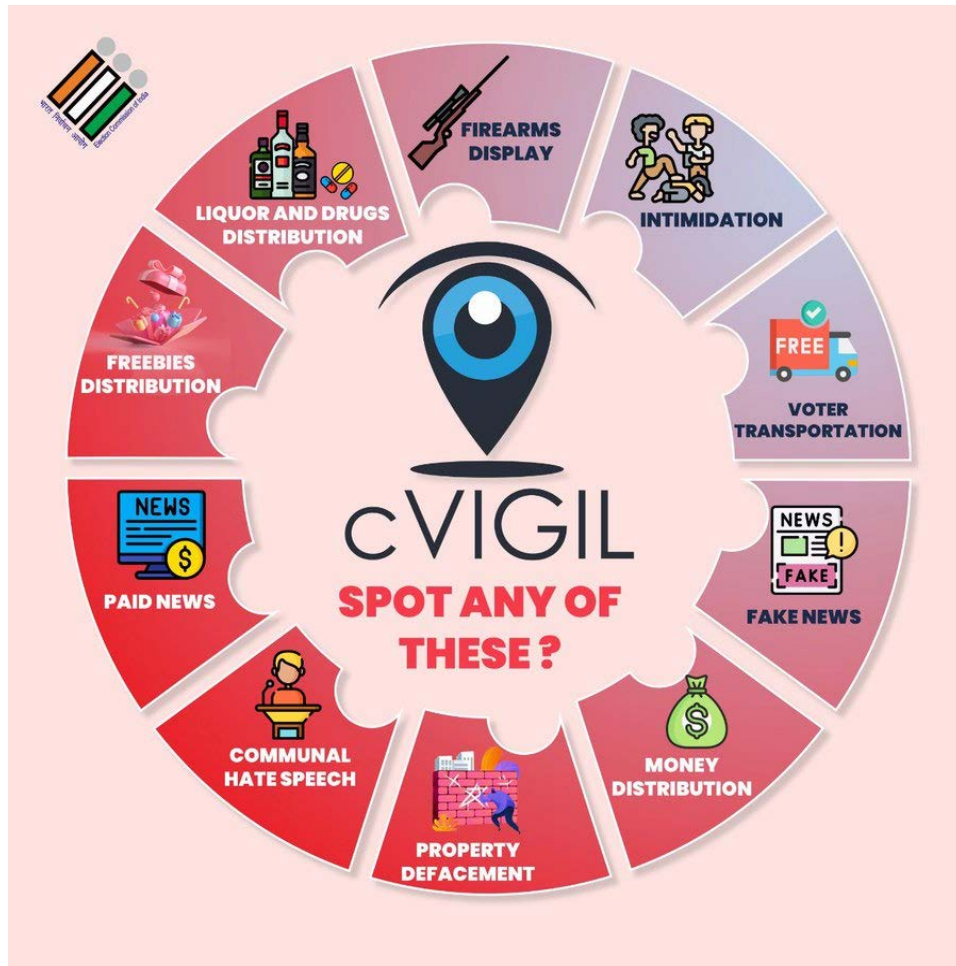
**We have the best strike rate!!**

Over **99%** of  
complaints resolved

Total complaints  
received (since election  
announcement)  
**over 79,000**

**RESPONSE TIME**  
Approx **89%** of complaints  
resolved within **100 mins**

SOCIAL MEDIA CELL



### Why does the election schedule show 544 instead of 543 constituencies?

- When the **Election Commission of India** announced the dates for the General Election on March 16, it was noticed that the **number of constituencies added up to 544** instead of tallying with the **543 Lok Sabha seats**.
- This is because **one Parliamentary constituency will have the distinction of going to the polls twice**.
- **Outer Manipur constituency** alone will have elections **on two days**. This is done taking into consideration the recent **ethnic violence in the north-eastern State**.

## 9. What is the relevance of the topic for UPSC CSE?

**For Prelims:** Electronic Voting Machines (EVMs), Postal Ballots, Election Commission (EC), Returning Officer (RO), Voter-Verifiable Paper Audit Trails (VVPATs), Chief Electoral Officers, Booth Level Officers (BLOs).

**For Mains:** The need for safety and security of Electronic Voting Machines and Postal Ballots in ensuring a robust, free and fair electoral process.

### Some previous years prelims questions

**Q1.** Consider the following statements: (2017)

- 1. The Election Commission of India is a five-member body.
- 2. The Union Ministry of Home Affairs decides the election schedule for the conduct of both general elections and bye-elections.
- 3. Election Commission resolves the disputes relating to splits/mergers of recognised political parties.

**Which of the statements given above is/are correct?**

- (a) 1 and 2 only
- (b) 2 only
- (c) 2 and 3 only
- (d) 3 only

**Ans. (d)**

### Some previous years mains questions

**Q1.** In the light of recent controversy regarding the use of Electronic Voting Machines (EVM), what are the challenges before the Election Commission of India to ensure the trustworthiness of elections in India? (2018)

## Some questions from this year and previous year's interview transcripts

**Board Sanjay Verma sir:**

- Electoral reforms you think should be brought?
- Online voting (he disagreed saying no trust on EVMs only)

**Board Dinesh Dasa sir:**

- As you have worked on EVM so much controversy, why so?

**Board Dinesh Dasa sir:**

- Role of technology in a democracy (talked about AI promoting inclusive growth and EVMs ensuring free and fair elections)

**Board Dinesh Dasa sir:**

- Which word you will choose
- From these two 1.EVM 2.Bull dozer
- Why EVM?

**Board RN Choubey sir:**

- Do you think EVMs can be hacked?
- Your opinion on simultaneous elections?
- Don't you think it will subvert regional issues?
- What is SVEEP?
- Have you heard of NOTA? Do you think it is democratic?

**Board RN Choubey sir:**

- EVM-VVPAT related allegations.
- What would you do as an election officer if such allegations emerge during the poll process by the political party?

**Board Dinesh Dasa Sir:**

- What issues are there in elections? Electoral process? Follow up questions on EVMs and criminalisation in politics?

## Some questions for QUIZ.

**Q1. Consider the following statements regarding Electronic Voting Machine(EVM)**

1. It was first used in the Paravur Assembly Constituency of Kerala in the year 1982.
2. Since 1999 all state elections and by-elections were held using EVMs.
3. ECI can record a maximum of 2,000 votes.

How many of the above statements are incorrect?

Select the correct answer using the code given below:

- (a) Only one
- (b) Only two
- (c) All three
- (d) None

**Ans. (a)**

**Q2. Consider the following statements regarding VVPAT Machines**

1. VVPAT Machines were first introduced in India in the 2014 Lok Sabha elections.
2. EVMs and VVPATs are separate entities and are not connected to any network.
3. VVPAT machines can be accessed only by the polling officers.

How many of the above statements are correct?

Select the correct answer using the code given below:

- (a) Only one
- (b) Only two
- (c) All three
- (d) None

**Ans.(c)**

## Some questions for POLL.

- Q1.** Can EVM be hacked ?
- (a) YES
  - (b) NO
  - (c) Can't say.
- Q2.** Should paper ballots be used in place of EVM ?
- (a) YES
  - (b) NO
  - (c) Can't say.
- Q3.** Can VVPAT ensure transparency in elections ?
- (a) YES
  - (b) NO
  - (c) Can't say.