P. R.GOVT. COLLEGE (AUTONOMOUS), KAKINADA

B.Sc./B.Com/B.A

Syllabus under CBCS w.e.f.2020-21

INFORMATION & COMMUNICATION TECHNOLOGY

SYLLABUS:

UNIT-I: (08 hrs)

Fundamentals of Internet: What is Internet?, Internet applications,Internet Addressing – Entering a Web Site Address, URL–Components of URL, Searching the Internet, Browser – Types of Browsers,Introduction to Social Networking: Twitter, Tumblr, LinkedIn, Facebook, flickr, Skype, yahoo, YouTube, WhatsApp .

UNIT-II:(08 hrs)

E-mail: Definition of E-mail -Advantages and Disadvantages –User Ids, Passwords, Email Addresses, Domain Names, Mailers, Message Components, MessageComposition, Mail Management.

G-Suite: Google drive, Google documents, Google spread sheets, Google Slides and Google forms.

UNIT-III:(10 hrs)

Overview of Internet security, E-mail threats and secure E-mail, Viruses and antivirus software, Firewalls, Cryptography, Digital signatures, Copyright issues.

What are GOI digital initiatives in higher education? (SWAYAM, SwayamPrabha, National Academic Depository, National Digital Library of India, E-Sodh-Sindhu, Virtual labs, e-acharya, e-Yantra and NPTEL).

Reference Books :

1. In-line/On-line : Fundamentals of the Internet and the World Wide Web, 2/e – by Raymond Greenlaw and Ellen Hepp, Publishers : TMH

2. Internet technology and Web design, ISRD group, TMH.

3. Information Technology – The breaking wave, Dennis P.Curtin, Kim Foley, Kunai Sen and Cathleen Morin, TMH.

P. R.GOVT. COLLEGE (AUTONOMOUS), KAKINADA
MODEL BLUE PRINT (W.E.F. 2020-2021)
B.Sc./B.Com/B.A
INFORMATION & COMMUNICATION TECHNOLOGY
SEMESTER-II

Time: 2 Hrs **Marks: 50**

Model Blue print for the question paper setter

Chapter Name	Essay Questions 10 Marks	Short Questions 5 Marks	Marks allotted to the chapter
UNIT-I	2	3	35
UNIT-II	2	3	35
UNIT -III	2	2	30
Total No. of questions	6	8	100

P.R.COLLEGE (AUTONOMOUS), KAKINADA
MODEL PAPER (W.E.F 2020-21)
B.Sc./B.Com/B.A

INFORMATION & COMMUNICATION TECHNOLOGY

SEMESTER-II

Sub: ICT **Paper: II**
Time: 2 hrs **Marks: 50**

SECTION – A

Answer any FOUR questions the following **4 x 5= 20 M**

1. Discuss briefly about advantages and disadvantages of Internet.
2. Explain about browsers.
3. What is URL? What are the Components of URL?
4. Explain about Email Addresses, Domain Names.
5. Explain about Google spread sheets.
6. Explain about Google forms.
7. What is a Computer Virus? Explain types of viruses.
8. What is Internet security?

SECTION – B

Answer any THREE questions the following **3 x 10= 30 M**

9. What is a Browser? Explain the different types of Browsers?
10. Explain about Social Networking sites with examples.
11. Define E-Mail. What are the advantages and disadvantages of E-mail?
12. Explain the Procedure for composing and sending an E-mail.
13. Discuss about Firewalls, Cryptography, Digital signatures.
14. Explain GOI digital initiatives in higher education.

QUESTION BANK

UNIT -I

Short Answer Questions:

1. **Discuss briefly about advantages and disadvantages of Internet.**

Internet is a world-wide global system of interconnected computer networks.

Advantages of Internet

- There are various apps available on the wed that uses Internet as a medium for communication. One can find various social networking sites such as: Facebook, Twitter, Yahoo, Google+
- One can surf for any kind of information over the internet. Information regarding various topics such as Technology, Health & Science, Social Studies, Geographical Information.
- The various modes for entertainment over internet.: Online Television, Online Games, Songs, Videos, Social Networking Apps
- Internet allows us to use many services like: Internet Banking, Matrimonial Services, Online Shopping, Online Ticket Booking, Online Bill Payment, Data Sharing, E-mail

Disadvantages of Internet

- There are always chances to loose personal information such as name, address, credit card number. Therefore, one should be very careful while sharing such information.
- Another disadvantage is the **Spamming**.Spamming corresponds to the unwanted e-mails in bulk.
- **Virus** can easily be spread to the computers connected to internet. Such virus attacks may cause your system to crash or your important data may get deleted.
- There are various websites that do not provide the authenticated information.

2. **Explain about browsers.**

Refer Essay Question Answer

3. **What is URL? What are the Components of URL?**

URL stands for Uniform Resource Locator, and is used to specify addresses on the World Wide Web. A URL is the fundamental network identification for any resource connected to the web (e.g., hypertext pages, images, and sound files).

Components of a URL

The four main components of URLs are the protocol, domain, path, and query.

For example: https://www.example.com/category-A/subcategory-A1/model-123.html

Protocol

The protocol or scheme of a URL indicates the method that will be used for transmitting or exchanging data. The most familiar scheme is the Hypertext Transfer Protocol (HTTP) or Hypertext Transfer Protocol Secure (HTTPS) for the transmission of HTML files. FTP (for files) and Mailto (for mails) are examples of other types of schemes.

In the example URL above, https:// is the URL's secure protocol.

Domain

The domain or hostname of a URL is a user-friendly expression of the Internet Protocol (IP) address of a website. It points to the location of the website's host server.

In the example above, the domain is www.example.com.

Path

The path that follows the domain name inside a URL points to a specific file or other resource location. It can also include a query string.

In our example URL, /category-A/subcategory-A1/model-123.html shows the path of the URL, which in this example, ends in a product page.

Query

The query string, also known as a fragment identifier, is frequently used for internal searches and is commonly preceded by a question mark (?).

4. **Explain about YouTube, WhatsApp.**

Refer Essay Question Answer

Essay Questions:

5. **What is Internet? Explain about Internet applications.**

Internet is a world-wide global system of interconnected computer networks. The Internet is a global network of billions of computers and other electronic devices. With the Internet, it's possible to access almost any information, communicate with anyone else in the world, and do much more.

Applications of Internet:

1. **Communication:** Computer users around the world extensively use the email service on internet to communicate with each other. Pictures, documents and other files are sent as email attachments.

2. **Job Search:** Nowadays, many people search for their jobs online as it is quicker and there is a large variety of job vacancies present. Some of the web sites providing this service are naukri.com, monster.com, summerjob.com, recruitmentindia.com etc.
3. **Online Shopping:** The internet has also facilitated the introduction of a new market concept consisting of virtual shops. For example amazon.com is a www based bookshop on the internet where information on all types of international books can be found and books can be ordered online.
4. **Stock market updates:** You can sell or buy shares while sitting on computer through internet. Several websites like ndtvprofit.com, moneypore.com provide information regarding investment.
5. **Travel:** One can use internet to gather information about various tourist place. It can be used for booking holiday tours, hotels, train, bus, flights and cabs. Some of the web sites providing this service are makemytrip.com, olacabs.com.
6. **Research:** Research papers are present online which helps in the researchers doing a literature review.
7. **Video conferencing:** It enables direct face to face communication across networks via web cameras, microphones and other communication tools. When video conferencing is used in education, it is easier to have interactive communications between teacher to teacher, teacher to classroom or classroom to classroom with students in different places.
8. **E Commerce:** E-Commerce(Electronic Commerce) is the buying and selling of goods and services or the transmitting of funds or data, over electronic medium.
   Example flipkart, snapdeal, amazon, paytm.
9. **Online payments:** An online payment is an electronic exchange of currency for purchased goods or services. Online payments are facilitated by 'payment gateways' or 'payment service providers'.
   Example: Paytm, Googlepay, Phonepay etc
10. **Social Networking:** Social networking is the use of Internet-based social media sites to stay connected with friends, family, colleagues, customers, or clients. Social networking can have a social purpose, a business purpose, or both, through sites like Facebook, Twitter, LinkedIn, and Instagram.
11. **Education:** The Internet has the availability of broad educational content on any topic with different types.
12. **Entertainment:** The Internet is the most effective means of entertainment. There are various options available on the Internet, which people can try, such as watching movies, playing online games, listening to songs, etc.

6. **What is a Browser? Explain the different types of Browsers?**

Web Browser Definition: A software application used to access information on the World Wide Web is called a Web Browser. When a user requests some information, the web browser fetches the data from a web server and then displays the webpage on the user's screen.

Netscape Navigator It was released in 1994. In the 1990s, it was the dominant browser in terms of usage share, More versions of this browser were launched by Netscape. Netscape helped make the Web graphical rather than a text-only experience. Many browsing features became standard after Netscape introduced them.

Internet Explorer: Internet Explorer (IE) is a product from software giant Microsoft. This is the most commonly used browser in the universe. This was introduced in 1995 along with Windows 95 launch. Internet Explorer is included in all Windows versions before Windows 10. The last version of IE, included with Windows 8, was Internet Explorer 11. With the introduction of Windows 10 in 2015, Microsoft also introduced Microsoft Edge, which is a replacement browser for Internet Explorer.

Google Chrome: This web browser is developed by Google and its beta version was first released on September 2, 2008 for Microsoft Windows. Today, chrome is known to be one of the most popular web browsers with its global share of more than 50%. With its clean design and advanced features, Chrome has quickly become one of the most popular web browsers worldwide.

Mozilla Firefox: Firefox is a new browser derived from Mozilla. It was released in 2004 and has grown to be the second most popular browser on the Internet. It has advanced security options that protect your system from spyware and malwares. Firefox has an interface which is very user friendly and the user can use a number of add-ons on top of that user can customize the browsing also. Firefox is a safe browser when it comes to protecting personal data.

Safari: Safari is a web browser developed by Apple Inc. and included in Mac OS X. It was first released as a public beta in January 2003. Safari has very good support for latest technologies like XHTML, CSS2 etc.

Opera: Opera is smaller and faster than most other browsers, yet it is full- featured. Fast, user-friendly, with keyboard interface, and more.

7. **Explain about Social Networking sites with examples.**

A social networking site is an online place where a user can create a profile and build a personal network that connects him/her to other users. The social networking phenomenon has spread rapidly all over the world.

The most well-known social media sites are Facebook, Twitter, Instagram and LinkedIn. These sites allow you to share photos, videos and information, organize events, chat, and play online games.

Facebook:

The Facebook website was launched on February 4, 2004 by Mark Zuckerberg, along with fellow Harvard College students and roommates. Facebook is one of the most popular social networks available to your business. Many people use these platforms to connect with family, friends, and brands. Users can create a user profile, add other users as "friends", exchange messages, post status updates and photos, share videos, use various applications (apps), and receive notifications when others update their profiles. Facebook also offers paid advertisements that allow you to attract new followers to help grow your business.

Twitter

This platform is used similarly to Facebook, with users posting photos, videos, status updates, links, polls, and more. The most significant distinction between these social networks is the size of the message. Twitter's unique attribute is that you only have 280 characters for each of your messages. Twitter also offers paid advertisements for your business.

LinkedIn

This social network is a great place for professionals to connect. It's an excellent platform for building professional relationships, sharing information, finding new jobs, and recruiting new candidates. You can also advertise to people who use LinkedIn. It's a great place to target professionals interested in your business.

Instagram

Instagram is great when you're running different types of social media campaigns. You can promote your products or services and provide your audience with a great visual representation of your brand.

Pinterest

This media sharing network focuses mostly on sharing and pinning photos. Users pin these photos to their boards and can refer back to them later. This media platform is excellent for sharing creative ideas, as well as your products. You can share photos that link to blog posts, recipes, and more.

YouTube

YouTube is a video-sharing platform where users watch a billion hour of videos every day. To get started, you can create a YouTube channel for your brand where you can upload videos for your subscribers to view, like, comment, and share. Besides being the second biggest social media site, YouTube (owned by Google) is also often known as the second largest search engine after Google. Available content includes video clips, TV clips, music videos, movie trailers, and other content such as video blogging, short original videos, and educational videos.

WhatsApp

WhatsApp is a popular mobile messaging app. You can use it to send images, texts, documents, audio, and video content to another user individually or in groups. Launched in 2010, the company is now owned by Facebook along with Instagram. Initially, WhatsApp was only used by people to communicate with their family and friends. Gradually, people started communicating with businesses via WhatsApp.

Tumblr

Tumblr is a blogging platform that allows several different post formats. You can include quotes, chats, videos, photos, and even audio content.

Vimeo

Vimeo is a professional video platform. Though not as widely used as YouTube, it offers quality features perfect for videographers and those who want to share cinematic content.

Telegram

This instant messaging network is similar to WhatsApp and is available across platforms in more than eight languages. However, Telegram has always focused more on the privacy and security of the messages you send over the internet by using its platform.

UNIT-II

Short Answer Questions:

1. What are the advantages of E-mail?

E-Mail or electronic mail is a system for sending messages from one individual to another via telecommunications links between computers or terminals using dedicated software. The sender and receiver must have email addresses to share their data. There are several web portals such as Yahoo, Gmail and Hotmail which supports the email service. Besides text, messages in email can be also in the form of video, audio and images.

Advantages of E-mail

- **Convenience:** there are not trips to post office and no need to search for stationary and stamps. Sending information through email is easy.
- **Speed:** email is fast, based on the speed of the underlying communication network.
- **Inexpensive:** once you are on-line, the cost of sending a message is small.
- **Printable:** a hard copy is easy to obtain.
- **Global:** increasingly, people and business all over the world are using email.
- **User Friendliness:** Emails are also easy to use. Even people with basic computer skills will be able to send and receive emails.
- **Advertisements:** Emails can also be used as a tool of product marketing.
- **Attachments:** Usage of attachments is another feature of an email. Besides text, attachments can be added to the mail. Attachments can be of any form such as Photos, Videos, Music, Document or a PDF file.

2. Explain about Email Addresses, Domain Names.

An email address is a unique identifier for an email account. It is used to both send and receive email messages over the Internet. Every email address has two main parts: a username and domain name. The username comes first, followed by an at (@) symbol, followed by the domain name.

username@exampledomainname.com

Username

The first part of an email address is the username. The username must be unique -- no two people or organizations can have the same username with the same provider .

@ Symbol

An "at," or "@," symbol is the second part of an email address. This fits in between the username and the domain of your email address.

Domain

The last part of an email address is the domain, which can be broken down into two portions: the mail server and the top-level domain. The mail server is the server hosting the email account. For example, Yahoo email accounts use "yahoo" as the server name, while Gmail uses "Gmail" as the server name.

Domain names: Domain names are used to identify one or more IP addresses. Domain names have two parts that are separated by a dot, such as example.com. A domain name is used as part of a URL to identify a website. The part that follows the dot is the top level

domain (TLD), or group to which the domain name belongs. For example, .gov is the TLD for U.S. government domains.

Every domain name has a suffix that indicates which top level domain (TLD) it belongs to. There are only a limited number of such domains. For example:

- gov - Government agencies
- edu - Educational institutions
- org - Organizations (non profit)
- mil - Military
- com - commercial business
- net - Network organizations

3. Explain about Google spread sheets.

Google Sheets is a web-based application that enables users to create, update and modify spreadsheets and share the data online in real time.

Google Sheets is typically used for spreadsheet collaboration across different geographic locations. Multiple users can modify a Google Sheets document in real time, with changes tracked for each individual user. Google Sheets is often compared to Microsoft Excel, as both applications are used for similar purposes.

Google Sheets features

Google Sheets offers a wide set of spreadsheet features, including:

- Text formatting.
- Formula input.
- Conditional formatting.
- Image import.
- The ability to create charts and graphs from data sets.
- The ability to utilize scripts.
- The use of a variety of templates
- Collaborative editing for sharing between computers, devices, and other users.

4. Explain about Google forms.

Google Forms is a web-based app used to create forms for data collection purposes. Students and teachers can use Google Forms to make surveys, quizzes, or event registration sheets. The form is web-based and can be shared with respondents by sending a link, emailing a message, or embedding it into a web page or blog post. Data gathered using the form is typically stored in a spreadsheet.

Features Of Google Forms

1. Anyone can design Google Form on the internet. You only need to have an active internet connection and a Google Account.
2. The creator of the Google forms can share it with the community around him and asks them to fill it out.
3. All the Google Forms responses are saved in an Excel The excel file is stored in Google Drive.
4. Once you're done gathering responses, you can close the form and download the results.

Applications of Google Forms

1. Create a survey With Google Forms

A Google Forms is an easy and efficient way to collect useful information associated with meetings or conferences.

2. Conducting Tests With Google Forms**:**

Teachers can easily conduct tests for their students using Google Forms tool.

Essay Questions:

5. Define E-Mail. What are the advantages and disadvantages of E-mail?

E-Mail or electronic mail is a system for sending messages from one individual to another via telecommunications links between computers or terminals using dedicated software. The sender and receiver must have email addresses to share their data. There are several web portals such as Yahoo, Gmail and Hotmail which supports the email service. Besides text, messages in email can be also in the form of video, audio and images.

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- **Attachments:** Usage of attachments is another feature of an email. Besides text, attachments can be added to the mail. Attachments can be of any form such as Photos, Videos, Music, Document or a PDF file.

Disadvantages of E-mail:

- **Misdirection:** with email, you are your own worst enemy. It is far more likely that you will accidentally send email to an unintended recipient than it is for someone actually to intercept your email.
- **Overload:** email can also be too convenient and result in a flood of mail.
- **Junk:** another more recent negative development involves junk email. This flooding of undesirable or inappropriate email is sometime referred to as spam and is becoming serious problem.
- **Virus Attacks:** Email can be one of source of virus. Especially viruses can reach out computers in the form of attachments and cause some serious damages to the system.
- **No response:** A mild frustration sometimes associated with using email is dealing with recipients who do not read and respond to their email on a regular basis.

6. Explain the Procedure for composing and sending an E-mail.

Message composition: To create and send a new email message, then follow these steps:

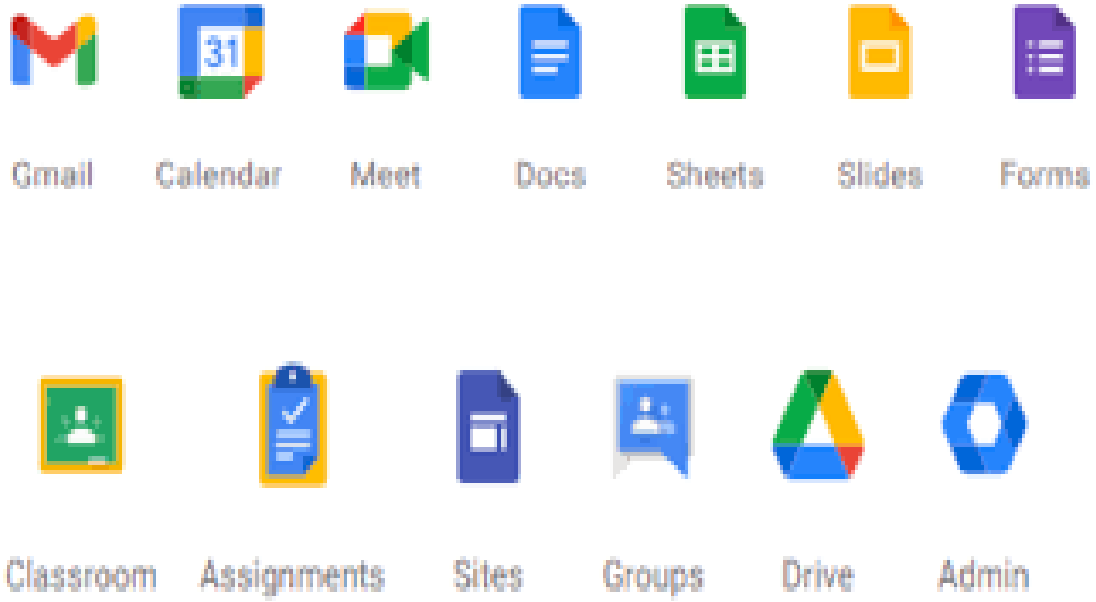
1. Click compose button.

2. Type the recipient's email address in the To box. Enter multiple addresses by separating them with a comma. NOTE: If the person is in your Address Book, you can just start typing the email address (or the name you've entered as their "Display Name") and a list of choices will appear. Just choose the correct one from the list.
3. In the CC box (carbon copy) type the email addresses you want to receive a copy of the email. (A recipient who is CC is able to see and correspond with the other recipients of the message.)
4. In the BCC box (blind carbon copy) type the email addresses you want to receive a copy of the email. (The email addresses of recipients who are BCC will not appear in the headers of the message.)
5. Type a brief description of the email message in the Subject box. For example, if you're sending out a recipe for oatmeal cookies, the subject might be "My oatmeal cookies recipe".
6. Type the body of the email message.
7. If you wish to add a signature to your email, select one from the Signature pull-down menu.
8. If you wish to attach files to this message, use the Browse buttons at the bottom of the page to choose files from your hard drive.
9. If you want to send your email message now, click Send.
10. If you want to send your email message later, or work on it more at a later time, click Save as a draft and you'll be able to retrieve it from the Drafts folder later.

7. Explain about G-Suite.

G Suite is a suite of productivity solutions developed by Google that offers a wide array of web-based applications and services designed to help organizations communicate, collaborate and store data.

App	Purpose of the App
Gmail	Send and receive email messages. You can also share files as attachments, organize messages, control email conversations and more.
Calendar	Maintain an online schedule of appointments and other events. You can also see reminders of upcoming events, schedule repeating events, share calendars and more.
Contacts	Create and maintain an online address book. For each contact, you can store info such as the person's name, email address, and phone number. You can also import contacts, group related contacts and more.
Photos	Google Photos automatically backs up photos and videos across all your devices, so they're safe and always available. With the app you have every photo you've ever taken right at your fingertips.
Docs	Create, edit, and collaborate on word processing documents. You can change the layout, add bulleted and numbered lists, work with headers and footers, format text, paragraphs and pages and more.
Sheets	Create, edit, and collaborate on spreadsheets. You can build formulas, sort and filter data, analyze data and more.
Slides	Create, edit, and collaborate on presentations. You can change the theme, show your presentation, create slides that include text, images, and shapes and more.
Meet	Set up and join online meetings. You can invite people to a meeting, share resources, record and live-stream a meeting and more.
Classroom	It enables teachers to create an online classroom area in which they can manage all the documents that their students need. Documents are stored on Google Drive and can be edited in Drive's apps, such as Google Docs, Sheets and so on.
Chat	Exchange real-time messages with members of your team, department or organization.
Groups	Join and create groups for posting messages, sharing files and more.
Forms	Create forms, quizzes, and surveys to gather information and opinions from members of your team, department or organization.
Keep	Create, edit and share notes.
Drive	Store, manage and share files online.



UNIT-III

Short Answer Questions:

1. What is a Computer Virus? Explain types of viruses.

Computer viruses are small software programs that are designed to spread from one computer to another and to interfere with computer operation. A virus might corrupt or delete data on your computer, use your e-mail program to spread itself to other computers, or even erase everything on your hard disk. Most Common Types of Viruses and Other Malicious Programs

- **Resident Viruses:** This type of virus is a permanent which dwells in the RAM memory. From there it can overcome and interrupt all of the operations executed by the system: corrupting files and programs that are opened, closed, copied, renamed etc
- **Multipartite Viruses:** Multipartite viruses are distributed through infected media and usually hide in the memory. Gradually, the virus moves to the boot sector of the hard drive and infects executable files on the hard drive and later across the computer system.
- **Direct Action Viruses:** The main purpose of this virus is to replicate and take action when it is executed. When a specific condition is met, the virus will go into action and infect files in the directory or folder that it is in and in directories.
- **Overwrite Viruses:** Virus of this kind is characterized by the fact that it deletes the information contained in the files that it infects, rendering them partially or totally useless once they have been infected.
- **Boot Virus:** This type of virus affects the boot sector of a floppy or hard disk. This is a crucial part of a disk, in which information on the disk itself is stored together with a program that makes it possible to boot (start) the computer from the disk.

2. What is Internet security?

Internet security is a term that describes security for activities and transactions made over the internet. It's a particular component of the larger ideas of cyber security and computer security, involving topics including browser security, online behavior and network security.

Internet security is a branch of computer security that involves various security measures taken for ensuring browser security, network security, security of other applications and operating systems. Since most of the cyber- attacks and malware programs originate from the internet, the primary goal of Internet security is to offer rules and regulations against cyber-attacks that arise from the Internet.

Internet security products

1.Antivirus

Antivirus and Internet security programs can protect a programmable device from malware by detecting and eliminating viruses; Antivirus software was mainly shareware in the early years of the Internet, but there are now several free security applications on the Internet to choose from for all platforms.

2.Security suites

So called "security suites" were first offered for sale in 2003 (McAfee) and contain a suite of firewalls, anti-virus, anti-spyware and more.

3. Explain about E-mail threats.

Securing email is especially crucial for organizations because a work inbox contains countless amounts of sensitive corporate information, including financial and operational information, legal information, and even trade secrets.

Top 5 Threats To Email Security on Large Enterprises

1. Phishing

Email phishing is a security attack used by cybercriminals who use it in an attempt to steal sensitive business information. This type of data includes usernames and passwords of CEOs, CFOs and other senior management, details about financial accounts or valuable information which can be sold to competitors.

2. Spoofing

A spoofing email is a strategy used during spam and phishing attacks. By falsifying the header of an email to make it seem like its coming from inside the company, an attempt is made to confuse employees to provide sensitive information or in some cases even bank transfers.

3. Malware

Malware, or malicious software, is a virus which contains coding programmed to attack and harm data, tech equipment or entire systems. Trojans, viruses, spyware, worms, adware, botnets and ransomware are all types of malware.

4. Ransomware

Ransomware is a specific type of malware which attacks the entire computer system and blocks access to users until the financial demand (ransom) is paid to the perpetrator.

5. Directory Harvest Attacks

A directory harvest attack (DHA) is an **email** threat carried out by spammers which has a goal of accessing the email database attached to a company domain.

Essay Questions:

4. Discuss about Firewalls, Cryptography, Digital signatures.

Firewalls

A firewall can be defined as a special type of network security device or a software program that monitors and filters incoming and outgoing network traffic based on a defined set of

security rules. It acts as a barrier between internal private networks and external sources (such as the public Internet).

A firewall is a cybersecurity tool that filters network traffic and helps users block malicious software from accessing the Internet

Firewalls have become so powerful, and include a variety of functions and capabilities with built-in features:

- Network Threat Prevention
- Application and Identity-Based Control
- Hybrid Cloud Support
- Scalable Performance
- Network Traffic Management and Control
- Access Validation
- Record and Report on Events

Depending on their structure and functionality, there are different types of firewalls. The following is a list of some common types of firewalls:

- Proxy Firewall
- Packet-filtering firewalls
- Stateful Multi-layer Inspection (SMLI) Firewall
- Unified threat management (UTM) firewall
- Next-generation firewall (NGFW)
- Network address translation (NAT) firewalls

Cryptography

Cryptography is technique of securing information and communications through use of codes so that only those person for whom the information is intended can understand it and process it. Thus preventing unauthorized access to information. The prefix "crypt" means "hidden" and suffix graphy means "writing".

Features of Cryptography are as follows:

1. **Confidentiality:**
   Information can only be accessed by the person for whom it is intended and no other person except him can access it.
2. **Integrity:**
   Information cannot be modified in storage or transition between sender and intended receiver without any addition to information being detected.
3. **Non-repudiation:**
   The creator/sender of information cannot deny his or her intention to send information at later stage.
4. **Authentication:**
   The identities of sender and receiver are confirmed. As well as destination/origin of information is confirmed.

Types Of Cryptography:

1. **Symmetric key cryptography:** In this type of cryptography, both the sender and receiver use a single key during the communication or transfer of information. The sender uses this key for encrypting plain text and sends the ciphered text to the receiver through the communication channel. The receiver uses the same key for decrypting the ciphered text on the other end. Upon deciphering he recovers the plain text.

2. **Asymmetric key cryptography:** this type of cryptography is also referred to as public-key cryptography. Here we use two related keys; public and private. The public key is used for encryption and the private key is used for decryption.
3. **Hash function:** In this type of cryptography, no key is used during the transfer of information. A fixed length of the hash value is used depending on the plain text which makes it impossible for contents of plain text to be recovered. Hash functions are commonly used by many operating systems to encrypt passwords.

Digital signatures

A digital signature is a mathematical technique used to validate the authenticity and integrity of a message, software or digital document. It's the digital equivalent of a handwritten signature or stamped seal, but it offers far more inherent security. A digital signature is intended to solve the problem of tampering and impersonation in digital communications.

Digital signatures can provide evidence of origin, identity and status of electronic documents, transactions or digital messages. Signers can also use them to acknowledge informed consent.

In many countries, including the United States, digital signatures are considered legally binding in the same way as traditional handwritten document signatures.

How Does Digital Signature Work?

Digital signatures deploy a commonly accepted technology known as Public Key Infrastructure (PKI). It enables users to create each digital transaction with a set of two keys:

Private Key: It is exclusively available to the signer of documents. It is not shared by anyone else. It ensures that singer's signature cannot be replicated by a person other than the signer himself. It is like a closely guarded secret. It is used to 'decrypt' the message.

Public Key: It is accessible to anyone and everyone to authenticate the signer's electronic signature. It allows users to send a secure message to the receiver. It is a published key. It is used to 'encrypt' the message.

If both keys match, then it is a secure transaction ensuring the validation of the document and signature. If they don't match, then it is a warning signal that the identity of the signer has been forged.

The digital signature process relies on three algorithms:

Key Generation: This algorithm generates a private key from a random set of private keys along with its corresponding public key mathematically linked to each other.

Signing: This algorithm generates a signature upon receiving a private key and the message that is to be signed.

Verification: This algorithm verifies the authenticity of the message through the signature and public key. If they don't match, the message is rejected. If they match, the message is accepted.

5. Explain GOI digital initiatives in higher education.

The use of Information and Communication technology (ICT) has great potential in improving the quality of education.

The Department of Higher Education, Ministry of Human Resource Development (MHRD) has undertaken many initiatives under 'National Mission on Education through Information and Communication Technology' (NMEICT) project.

SWAYAM:

The 'Study Webs of Active Learning for Young Aspiring Minds' (SWAYAM) is an integrated platform for offering online courses and covering school (9^{th} to 12^{th}) to Post Graduate Level. The online courses are being used not only by the students but also by the teachers and non-student learners, in the form of lifelong learning. It may be accessed on swayam.gov.in

SWAYAM Prabha:

SWAYAM Prabha is an initiative to provide 32 High Quality Educational Channels through DTH (Direct to Home) across the length and breadth of the country on 24X7 basis. It has curriculum-based course content covering diverse disciplines.

National Academic Depository

National Academic Depository (NAD) is a 24X7 online store house of all academic awards viz.certificates, diplomas, degrees, mark-sheets etc. duly digitised and lodged by academic institutions / boards / eligibility assessment bodies. NAD not only ensures easy access to and retrieval of an academic award but also validates and guarantees its authenticity and safe storage.

National Digital Library (NDL): The National Digital Library of India (NDL) is a project to develop a framework of virtual repository of learning resources with a single-window search facility. There are more than 3 crore digital resources available through the NDL.

E-Sodh-Sindhu

The main objective of the e-ShodhSindu: Consortia for Higher Education E-Resources is to provide access to qualitative electronic resources including full-text, bibliographic and factual databases to academic institutions at a lower rates of subscription.

Virtual labs

Virtual lab is defined as a virtual teaching and learning environment aimed at developing students' laboratory skills. They are one of the most important e-learning tools. Students can also strengthen their concepts by performing Virtual labs experiments at a place and time of their choice, outside lab hours.

e-Acharya

The INFLIBNET Centre has developed a web-based interface called "e-Acharya: Integrated e-Content Portal" for all e-content projects, developed / funded under the National Mission of Education through ICT.

e-Yantra

e-Yantra is a project for enabling effective education across engineering colleges in India on embedded systems and Robotics. The training for teachers and students is imparted through workshops where participants are taught basics of embedded systems and programming.

NPTEL

NPTEL (National Programme on Technology Enhanced Learning) is an initiative taken by the Indian Institute of Technologies of India and the Indian Institute of Science for creating course content in engineering and science. NPTEL is one of the largest online repositories of engineering course material and one of the most successful multi-institutional projects in the country.