

PAPER – 6 : INFORMATION TECHNOLOGY

Question No. 1 is compulsory.

Answer any four questions from remaining six questions.

Question 1

(a) Convert the following from one system to another system alongwith the Working Notes:

- (i) $(1357)_{10} = (\quad)_2$
- (ii) $(1463)_{10} = (\quad)_8$
- (iii) $(101101110)_2 = (\quad)_{16}$
- (iv) $(573)_8 = (\quad)_{16}$
- (v) $(1100100110)_2 = (\quad)_8$ (1 × 5 = 5 Marks)

(b) Describe briefly, the following terms with reference to Information Technology:

- (i) Interpreter
- (ii) Stored Program Concept
- (iii) Toggle
- (iv) Object Program
- (v) Router. (1 × 5 = 5 Marks)

(c) Give one or two uses for each of the following:

- (i) Use of MACROS
- (ii) Use of BIOS
- (iii) Use of Parallel Ports
- (iv) Use of Web Browser
- (v) Use of Repeaters. (1 × 5 = 5 Marks)

(d) Write True or False for each of the following:

- (i) Compiler is one of the hardware devices in a computer.
- (ii) The Address BUS is a set of wires that connects the CPU and RAM and carries the memory address.
- (iii) The F2 key is used to edit the formula cell in a spreadsheet.
- (iv) A spooling software is used to compensate the speed difference between the computer and its peripheral devices.
- (v) DML describes the data type and name of each field. (1 × 5 = 5 Marks)

Answer

(a) (i) $(1357)_{10} = (\quad)_2$

2	1357	Remainder
2	678	1
2	339	0
2	169	1
2	84	1
2	42	0
2	21	0
2	10	1
2	5	0
2	2	1
2	1	0
	0	1



Hence $(1357)_{10} = (10101001101)_2$

(ii) $(1463)_{10} = (\quad)_8$

8	1463	Remainder
8	182	7
8	22	6
8	2	6
2	0	2



Hence, $(1463)_{10} = (2667)_8$

(iii) $(101101110)_2 = (\quad)_{16}$

To convert the given number from binary to hexadecimal number, we will combine the digits in groups of four, adding leading zeros if required.

$$\begin{aligned}
 (101101110) &= 0001 \ 0110 \ 1110 \\
 &= 1 \ 6 \ E
 \end{aligned}$$

Hence, $(101101110)_2 = (16E)_{16}$

$$\begin{aligned}
 \text{(iv) } (573)_8 &= (\quad)_{16} \\
 (573) &= \begin{array}{ccc} 101 & 111 & 011 \\ 0001 & 0111 & 1011 \\ 1 & 7 & B \end{array}
 \end{aligned}$$

$$\text{Hence, } (573)_8 = (17B)_{16}$$

$$\text{(v) } (1100100110)_2 = (\quad)_8$$

To convert the given number from binary to octal, we will combine the digits in groups of three, adding leading zeros if required.

$$\begin{aligned}
 (1100100110) &= \begin{array}{cccc} 001 & 100 & 100 & 110 \\ 1 & 4 & 4 & 6 \end{array} \\
 &= \begin{array}{cccc} 1 & 4 & 4 & 6 \end{array}
 \end{aligned}$$

$$\text{Hence, } (1100100110)_2 = (1446)_8$$

- (b) (i) Interpreter: It refers to a language translator that converts source program written in high level language to machine code and executes it immediately statement by statement.
- (ii) Stored program concept: Computers can perform variety of mathematical calculations without error. They can sort data, merge lists, search files, make logical decisions and comparisons. However, computer is devoid of any original thinking. It is provided with a set of instructions. These instructions are stored in primary memory and executed under the command of the control unit of CPU. This is known as stored program concept.
- (iii) Toggle: It is a switch or control code that turns an event on or off by repeated action or use. It also means to turn something on or off by repeating the same action.
- (iv) Object program: It refers to a program expressed in a machine language, which can be directly executed by a particular computer. A compiler takes source program as an input and produces the object code/program.
- (v) Router: It is a special purpose computer along with software that handles the connection between two or more networks. Routers spend all their time looking at the destination addresses of the packets passing through them and deciding which route to send them on.
- (c) (i) Use of Macro: Macro is a small program used for carrying out a pre-recorded series of steps by giving few keyboard shortcuts. It automates the tasks, and carries out those pre-defined steps automatically once it is triggered.
- (ii) Use of BIOS: BIOS stands for Basic Input Output System. It is a small chip on the motherboard that loads the hardware settings required to load various devices like keyboard, monitor or disk drives. Most new PCs come with flash BIOS – these BIOS can be software upgraded to support new devices.

- (iii) Use of parallel ports: These are used to connect external input/output devices like scanners or printers. Parallel ports facilitate the parallel transmission of bits of data, usually one byte at a time. Parallel ports use 25 pins RS 232 C connector.
- (iv) Use of Web Browser: It is a client program (software) that is used to look at various kinds of Internet resources. Mosaic, Netscape Navigator and Internet Explorer are some of the commonly used web Browsers.
- (v) Use of Repeaters: These are devices that solve the snag of signal degradation as data is transmitted along various cables. Repeater boosts or amplifies the signal before passing it through to the next section of cable.
- (d) (i) False
 (ii) True
 (iii) True
 (iv) True
 (v) False.

Question 2

Distinguish between the following. Answer any four:

- (i) Cache memory and ROM
- (ii) On line system and Batch processing
- (iii) Ring Network and Star Network
- (iv) Analog computer and Digital computer
- (v) Network-attached storage and Direct-attached storage. (5 × 4 = 20 Marks)

Answer

- (i) Cache Memory and ROM: Cache memory refers to internal memory on the processor. It is a temporary memory and is used to boost the processing power of the computer significantly. On the other hand, ROM or Read-only memory is used for Micro programs not available to normal users. The term read-only means that the storage cannot be altered by regular program instructions. The information is stored permanently in such memory at the time of manufacturing. One set of instructions found in ROM is called ROM – BIOS which stands for Read-only Memory Basic Input Output system. It is used for performing the basic control and supervisory operations of the computer.

There are two types of cache memory. The cache that comes with the processor is called Level One (L1) cache. This cache runs at the processor's clock speed, and therefore is very fast. The cache is divided into 2 sections – one for data, the other for instructions. Generally, more the L1 cache, faster the processor. Additionally, PCs also include a much slower secondary, or Level Two (L2) cache. This cache resides on the motherboard and delivers slower performance when compared with the L1 cache.

On the other hand, there are various types of ROM available. PROM or Programmable Read Only Memory is a non-volatile memory, which allows the user to program the chip with a PROM writer. The chip can be programmed once, thereafter, it cannot be altered.

EPROM or Erasable Programmable Read Only Memory can be electrically programmed. Unlike ROM and PROM chips, EPROM chips can be erased and reprogrammed. Exposing the chip to Ultra-violet light performs erasure.

In EEPROM or Electricity Erasable Programmable Read Only Memory, data can be erased by applying electrical charges.

- (ii) On-line systems and Batch processing: Online systems refer to processing of individual transactions as they occur from their point of origin as opposed to accumulating them into batches. Aside from transaction processing and file updating, inquiries can also be handled by the online processing systems.

On-line Systems are in use in various organizations for applications such as Electricity and Gas Boards, Banking industry, Tour operators and Stock exchanges.

On-line systems offer following benefits:

- (a) Integration of clerical staff with the computer.
- (b) Elimination of tedious tasks.
- (c) Reduction in paper work.
- (d) Improved accuracy.
- (e) Improved file updating.
- (f) Management information more readily available.
- (g) Improved customer services.
- (h) Reduced data preparation cost.

Batch Processing, on the other hand is used in those business applications that consist of high volume of input transactions. In this, batches of transactions are accumulated in a file sorted by the key field and processed against the master file to update the latter and produce the desired results. This job is done periodically and scheduled at a non-peak time depending upon the workload. Under batch processing, the files can be stored on sequential media also.

- (iii) Ring Network and Star Network: In Ring Network topology, the network cable passes from one node to another until all nodes are connected in the form of a loop or ring. There is a direct point-to-point link between two neighboring nodes. These links are unidirectional which ensures that transmission by a node traverses the whole ring and comes back to the node, which made the transmission. In Star Network topology, the network is characterized by communication channels emanating from centralized computer system. That is, processing nodes in a star network interconnect directly with a central system. Each terminal, small computer, or larger main-frame can communicate only with the central site and not with other nodes in the network. If it is desired to

transmit information from one node to another, it can be done only by sending the details to the central node, which in turn sends them to the destination.

Ring networks offer high performance for a small number of workstations or for larger networks where each station has a similar workload. These networks can span longer distances than star networks and are easily extendable. A star network is particularly appropriate for organizations that require a centralized database or a centralized processing facility. In a star network, it is easy to add new nodes and also remove nodes. A node failure does not bring down the entire network. It is easier to diagnose network problem through a central hub.

- (iv) **Analog computer and Digital computer:** Analog computers process data input in a continuous form. Data such as voltage, resistance or temperature and pressure etc. are represented in a computer as a continuous, unbroken flow of information. In engineering and scientific applications where quantities to be processed exist in wave forms or continually rising and falling voltages, pressure and so on, analog computers are very useful.

Digital computers, on the other hand, count and accept letters or numbers through various input devices that convert the data into electric pulses, and perform arithmetic operations on numbers in discrete form. In addition to performing arithmetic operations, they are also capable of storing data for processing, performing logical operations, editing or deleting the input data and printing out the result of its processed routine at high speed.

- (v) **Network-attached storage and direct-attached storage:** Network-attached storage (NAS) is a dedicated shared storage solution that attaches to a network topology, becoming immediately and transparently available as a network resource for all clients. NAS is platform and operating system independent. It can be attached without powering down the network, and requires no changes to the existing file servers. A NAS device is typically a stand alone, high performance, single-purpose system or component. It serves specific storage needs with its own operating system and integrated hardware and software. NAS devices are well suited to serve heterogeneous networks. They enable file and data sharing among different types of clients.

Direct attached storage (DAS), on the other hand, is a storage device that connects directly to a single server. Network workstations access the server to connect to this storage. Because the server may be handling distributed applications such as e-mail or databases, the performance of DAS is typically not as high as that of networked storage. DAS uses the security features of the server's network operating system.

Question 3

- (a) Describe various factors which determine the best file organization for an application.
- (b) Describe the various types of data communication modes.
- (c) An electric supply company charges the following rates for its domestic consumers:

No. of units consumed	Charges/unit (Rs.)
For the first 200 units	1.60
For the next 300 units	2.10
Over 500 units	3.90

Surcharge @ 20% of the bill is to be added to the charges.

Draw a Flow chart for the above, which will read the consumer number and the number of units consumed and print out the total charges with the consumer number and the units consumed.
(5 + 5 + 10 = 20 Marks)

Answer

- (a) Best file organization: There are several factors that must be considered for determining the best file organization for a particular application. These are described below:

File volatility: It refers to the number of additions and deletions to the file in a given period of time. The payroll file for a construction company where the employee roster is constantly changing is a highly volatile file. An ISAM file would not be a good choice in this situation, since additions would have to be placed in the overflow area and constant reorganization of the file would have to occur. Other direct access methods would be better. Perhaps even sequential file organization would be appropriate if there were no interrogation requirements.

File activity: It is the proportion of master file records that are actually used or accessed in a given processing run. At one extreme is the real-time file where each transaction is processed immediately and hence at a time, only one master record is accessed. This situation obviously requires a direct access method. On the other extreme, in payroll application, each record is accessed when payroll is processed. Therefore, sequential master file would be more efficient.

File interrogation: It refers to the retrieval of information from a file. If the retrieval of individual records must be fast to support a real-time operation such as airline reservation then some kind of direct organization is required.

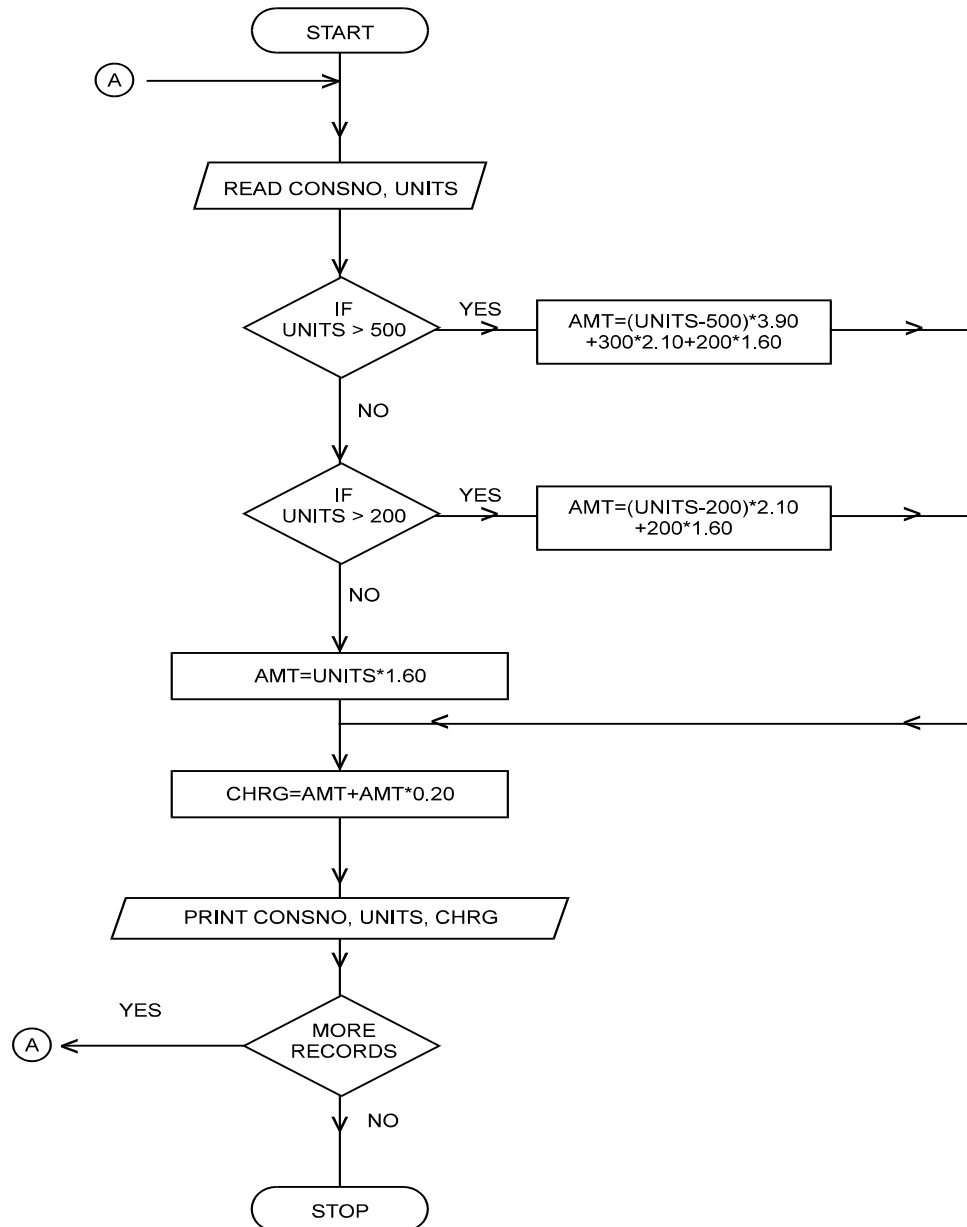
- (b) There are three different types of data communication modes:

Simplex: A simplex communication mode permits data to flow in only one direction. A terminal connected to such a line is either a send-only or a receive – only device. Simplex mode is seldom used because a return path is generally needed to send acknowledgements, control or error signals.

Half duplex: In this mode, data can be transmitted back and fourth between two stations, but data can only go in one of the two directions at any given point of time.

Full duplex: A full duplex connection can simultaneously transmit and receive data between two stations. It is most commonly used communication mode. A full duplex line is faster, since it avoids the delay that occur in a half-duplex mode each time the direction of transmission is changed.

(c) The required flow chart is given below:



Question 4

- (a) What are the important decisions which influence the physical design of a Database? Explain.
- (b) Describe briefly the various features of Data centres.
- (c) Explain the benefits offered by electronic commerce application and implementation.

(5 + 5 + 10 = 20 Marks)

Answer

- (a) Important decisions that influence the physical data base design are discussed below:
 - (i) Choosing the storage format called data-type for each attribute from the logical data model. The format is chosen to minimize storage space and to maximize data integrity.
 - (ii) Grouping attributes from the logical data model into physical records.
 - (iii) Arranging similarly structured records in secondary memory (primary hard disks) so that individual and groups of records (called file organizations) can be stored, retrieved and updated rapidly. Consideration may also be given to protect data and recovering data after errors are found.
 - (iv) Selecting structures (called indexes and database architectures) for storing and connecting files to make retrieval of related data more efficient.
 - (v) Preparing strategies for handling queries against the database that will optimize performance and take advantage of the file organizations and indexes that the users have specified. Efficient database structures will be of benefit only if queries and the database management systems that handle those queries are tuned intelligently to use those structures.
- (b) Features of data centers:
 - (i) Size: Data centres are characterized foremost by the size of their operations. A financially viable data center could contain from a hundred to several thousand servers. This would require a minimum area of around 5,000 to 30,000 square meters. Apart from this, the physical structure containing a data center should be able to withstand the sheer weight of the servers to be installed inside. Thus, there is a need for high quality construction.
 - (ii) Data security: Another issue critical for data centres is the need to ensure maximum data security and 100 per cent availability of the facilities. Data centres have to be protected against intruders by controlling access to the facility and by video surveillance. They should be able to withstand natural disasters and calamities, like fire and power failures. Recovery sites must be well maintained as it is here that everything in the data center is replicated for failure recovery.

- (iii) Availability of Data: The goal of a data center is to maximize the availability of data and to minimize potential downtime. To do this, redundancy has to be built into all the mission critical infrastructure of the data center.
 - (iv) Electrical and power systems: A data centre should provide the highest power availability with uninterrupted power systems.
 - (v) Security: Physical security and systems security are critical to operations. Thus, it should provide both types of security measures to ensure the security of equipments and data placed at the data center.
- (c) Benefits of Electronic Commerce applications:
- (1) Reduced costs to buyers from increased competition in procurement as more suppliers are able to compete in an electronically open marketplace.
 - (2) Reduced errors, time, and overhead costs in information processing by eliminating requirements for re-entering data.
 - (3) Reduced costs to suppliers by electronically accessing on-line databases of bid opportunities, on-line abilities to submit bids, and on-line review of rewards.
 - (4) Reduced time to complete business transactions, particularly from delivery to payment.
 - (5) Creation of new markets through the ability to easily and cheaply reach potential customers.
 - (6) Easier entry into new markets, especially geographically remote markets, for companies of all sizes and locations.
 - (7) Better quality of goods as specifications are standardized and competition is increased, and improved variety of goods through expanded markets and the ability to produce customized goods.
 - (8) Faster time to market as business processes are linked, enabling seamless processing and eliminating time delays.
 - (9) Optimization of resource selection as businesses form cooperative teams to increase the chances of economic successes, and to provide the customer products and capabilities more exactly meeting his or her requirements.
 - (10) Reduced inventories and reduction of risk of obsolete inventories as the demand for goods and services is electronically linked through just-in-time inventory and integrated manufacturing techniques.
 - (11) Ability to undertake major global programs in which the cost and personnel needed to manage a non-automated system would be unreasonable and prohibitive.
 - (12) Reduced overhead costs through uniformity, automation and large scale integration of management processes.
 - (13) Reduced use of ecologically damaging materials through electronic coordination of activities and the movement of information rather than physical objects.

- (14) Reduced advertising costs.
- (15) Reduced delivery cost, notably for goods that can also be delivered electronically.
- (16) Reduced design and manufacturing cost.
- (17) Improved market intelligence and strategic planning.
- (18) More opportunity for niche marketing.
- (19) Equal access to markets.

Question 5

- (a) Explain the concept of mail merge used in MS-WORD.
- (b) Explain the various types of decision tables.
- (c) Explain briefly the various tools offered by MS-WORD for efficient writing.
- (d) Define the following functions used in MS-EXCEL:
 - (i) DMAX
 - (ii) VAR
 - (iii) SUM
 - (iv) INT
 - (v) FV

(5 + 5 + 5 + 5 = 20 Marks)

Answer

- (a) Mail Merge: Mail Merge is one of the most important tools of MS-Word. It is efficient and less time consuming way of preparing mass mailing for a list of addresses. It is a tool for producing repetitive document, and gives the flexibility, in personalizing each copy of it with information such as names, addresses, dates etc.

Components of Mail Merge: Mail merge is built around two sets of components – main document and data source. The main document is a form letter. It contains merge fields (or field names) where data would be merged. The field names would be replaced with the field contents coming from the data source at the time of merging. The data source is a file that contains information like name, address etc., which is merged with the main document to create a final product. The data source can be very easily picked up from Access database, an Excel spreadsheet, Microsoft Address Book or one created in MS-Word.

- (b) There are three types of decision tables as discussed below:
 - (i) Limited Entry Tables: In this type of decision table, the condition and action statements are complete. The condition and action entries merely define whether or not a condition exists or an action should be taken. The symbols used in the condition entries are:
 - Y : Yes, the condition exists.

N : No, the condition does not exist.

– : Irrelevant, the condition does not apply, or it makes no difference whether the condition exists or not.

The symbols used in the action entries are:

X : Execute the action specified by the action statement.

– : Do not execute the action specified by the action statement.

- (ii) Extended Entry Table: The condition and action statements in an extended entry table are not complete, but are completed by the condition and action entries.
 - (iii) Mixed Entry Table: It combines both the limited and extended entry forms. While the limited and extended entry forms can be mixed within a table, only one form may be used within a condition statement/entry or an action statement/entry.
- (c) MS-Word offers several useful tools for efficient writing and to increase efficiency. These are:
- Auto Correct: Auto Correct has a dictionary of its own which contains a list of commonly mistyped words. The user can customize this dictionary by making additions to it of the words one mistypes. The user may also provide the correct spelling of the word with which Word should replace the mistyped one. Once the entry is in the Auto Correct dictionary, Word automatically makes correction of such words.
 - Auto Text: Auto Text is a unique feature of Word. It allows the user to store formatted text, even paragraphs and graphics. These can be recalled by pressing some keys. Auto Text is like Auto Correct in that it also has dictionary of its own and can be customized. However, AutoText has to be explicitly called to allow it to work. AutoText has an AutoComplete tip that will complete the text without the user having to type the entire word.
 - Spelling and Grammar: As English is not a very phonetic language; the spelling of some words can be learnt only by memorizing. As an example, a word 'achieve' has to be spelt 'achieve' or 'acheive'. One of the first tools that the word processors came equipped with to beat the electronic typewriter was the spell check. The spell checking function checks each word in the document against the dictionary and underlines it with a red curly line if a word with wrong spelling appears or is not found in the dictionary. There are numbers of options available, which the user can set in the software.
 - Thesaurus: The thesaurus is a useful writing tool that comes along with the word processor. If the user is unhappy with the choice of a word, he can easily look up the thesaurus to find a more precise word.
 - Find and Replace Test: 'Find' helps to locate specific text in a document while 'Replace' helps to substitute it with new text. The user has the option of replacing all words with one keystroke if he is sure that all the entries of that word need to be replaced. However,

if one wants to replace only some of the entries of the word then MS-Word will take one through the document, entry after entry.

- (d) (i) DMAX: It is a database function. It returns the largest number in the field(column) of records in the database that matches the conditions specified.
- (ii) VAR: It is a Statistical function, which is used to estimate the variance based on a sample.
- (iii) SUM: It is a statistical function, which adds all the numbers in a range of cells.
- (iv) INT: It is a mathematical function that computes the integral part of the value. All fractional values are truncated and only the integral part of the value is retained.
- (v) FV: It is a financial function which calculates the future value for a series of equal investments (also called annuity) earning at fixed periodic rate of interest.

Question 6

- (a) Explain the duties of Certifying Authorities under Section 30 of Information Technology Act.
- (b) Write down the typical steps in using audit package.
- (c) Describe the salient features of EX.NGN accounting package.
- (d) What do you mean by object-oriented programming? Explain its advantages.

(5 + 5 + 5 + 5 = 20 Marks)

Answer

- (a) Duties of Certifying Authorities under Section 30 of Information Technology Act are stated below:
 - (1) (a) Make use of hardware, software and procedures that are secure from intrusion and misuse;
 - (b) Provide a reasonable level of reliability in the services, which suit to the performance of intended functions.
 - (c) Adhere to security procedures to ensure that the secrecy and privacy of the digital signatures are assured.
 - (d) Observe such other standards as may be specified by regulations.
- (2) Every certifying Authority shall also ensure that every person employed by him complies with the provisions of the Act, or rules, regulations or orders made there under.
- (3) A certifying Authority must display its license at a conspicuous place of the premises in which it carries on its business. A certifying Authority whose licence is suspended or revoked shall immediately surrender the licence to the controller.

- (4) Certifying Authority shall disclose its digital signature certificate, which contains the public key corresponding to the private key used by that authority and other relevant facts.
- (b) Typical steps in using audit package are enumerated below:
 - (i) Define the audit objectives.
 - (ii) Identify the tests that the package will be required to do in order to assist the meeting of the audit objectives.
 - (iii) Make out the package input forms for these tests.
 - (iv) Compile the package on the computer, clearing reported edit errors. There should be full edit of the parameter cards to execution (step 7). Maintain security over the package and the audit tests at all times.
 - (v) If a program was used to add coded routines to the package, to fill out the input forms or to advise generally, his work must be tested.
 - (vi) Obtain copies of the application files to be tested.
 - (vii) Attend the execution of the package against the copy files.
 - (viii) Maintain security of the copy files and output until the tests have been fully checked out.
 - (ix) Check results of the test and draw audit conclusions.
 - (x) Interface the test results with whatever subsequent manual audit work has to be done.
- (c) The accounting package EX.NGN is compatible to the Windows Operating System and developed in Visual Studio VC++. It has the following salient features:
 - (i) It is 32-bit application, compatible to Windows OS.
 - (ii) It has multitasking facility, which allows performing various functions simultaneously.
 - (iii) It is completely GUI based.
 - (iv) Different security passwords can be set for various activities.
 - (v) It has zooming facility to obtain more detailed information at transaction level.
 - (vi) It provides all the accounting support without demanding to remember various codes for different accounts.
 - (vii) It provides the facility to customize invoice, receipt bill, payments with some particular information, which may not be part of the pre-defined documents.
 - (viii) It supports multiple companies' information to be created and maintained.
 - (ix) It can prepare 72 different types of reports in accounting, which include balance sheet, profit and loss account, trial balance, stock position, financial summary, and bank reconciliation etc.

- (x) It has a powerful feature, which enables to capture information for subsequent analysis. It also allows constructing queries for different kinds of information.
- (d) With traditional programming approaches, developing a new program means writing entirely new code. In case of a complex program, developing it from scratch and achieving a reasonable quality level becomes a formidable task. The solution of these problems is a new way of developing programs using an object oriented programming (OOP). An object is a predefined set of program codes that, after having been written and tested, will always behave the same way so that it can be used for other applications. All programs consist of specific tasks such as saving or retrieving data and calculations. In OOP, an object is written for each specific task and saved in the library so that anyone can use it. Objects can be modified, reused, copied or created.

In OOP, objects are selected by pointing to a representative icon, small amount of code necessary for finishing the program is written and then linking these objects together creates a new program. OOP offers following advantages:

- It is easy to use.
- It allows graphical user interface.
- It enables faster development of programs.
- Programs produced are more reliable.
- When an object is updated, all programs using that object are updated automatically.

Question 7

Write short notes on the following. Answer any four:

- (i) WORM Disks
- (ii) Bar Code Reader
- (iii) Web Casting
- (iv) World Wide Web
- (v) Digital Signature.

(5 × 4 = 20 Marks)

Answer

- (i) WORM Disks: It stands for write once, read many optical laser disks, or WORM disks. These are used by end user companies to store their own proprietary information. Once the data have been written to the medium, they only can be read, not updated or changed. The PC version of a WORM disks cartridge, which looks like a 5¼ inch version of the 3½ inch diskette, has a capacity of 200 MB. Access times for CD-ROM and WORM drives tend to be quite slow by hard disk drive standards, ranging from 100 to 300 milliseconds. The WORM disks cartridge is a feasible alternative to magnetic tape for archival storage; for example, a company might wish to keep a permanent record of all financial transactions during the last year. Another popular application of WORM disks is an information system that requires the merging of text and images which do not change for a period of time.

- (ii) **Bar Code Reader:** It is an input device, most commonly found in supermarkets and departmental stores. It converts the bar code, which is a pattern of printed bars on products, into a product code by emitting a laser beam to reflect off the bar code image. A light sensitive detector identifies the bar code image by recognizing special bars at both ends of the image. Once the detector has identified the bar code, it converts the individual bar patterns into numeric digits and feeds that number to the computer, just as though the number had been typed on a key board. The special bars at each end of the image are different, so the reader can tell whether the bar code has been read right side up or upside down. After the bar code reader converts a bar code image into a number it feeds that number to the computer, as if the number had been typed on a keyboard.

It provides following advantages:

- Improves accuracy of data entry
 - Better customer service
 - Faster check out at the point of sale
 - Greater control and reliability of inventory records
 - Most widely used input device after the keyboard and mouse.
- (iii) **Webcasting or push technology** is web-based technology. This allows users to passively receive broadcast information rather than actively search the Web for information. Push technology allows users to choose from a menu of sources, specifying what kind of information they want to receive. Once selected, the information is automatically forwarded to the user. Internet news services, which deliver the day's activities to the user's desktop, are an example of push technology.

Users can also download software, select the frequency with which they will receive services, and subscribe to a variety of information sources. There is very little cost involved to the user for push services because information is delivered with advertising, and users view their custom-tailored news off-line. Webcasting eliminates the frustration of the user which he/she faces while surfing the Internet to get right kind of information.

- (iv) **World Wide Web :** The World Wide Web (WWW) or the Web is a component of the Internet that provides access to large amounts of information located on many different servers. The Web also provides access to many of the services available on the Internet.

The fundamental unit of the Web is the Web page. The Web page is a text document that contains links to other Web pages, graphic and audio files, and other Internet services such as file transfer protocol (FTP) and E-mail. Tens of thousands of Web servers are connected to the Internet running special software in the servers allowing the users to access Web pages. A user can access directly any Web page on one of these servers and follow the links to other pages. This process creates a Web of links around the world and so the name World Wide Web.

To view a Web page, the user must use a special client software package called a Web browser. There are number of browsers in the market, like Mosaic, Netscape Navigator and Internet Explorer etc.

- (v) Digital Signature: Digital Signature means authentication of any electronic record by a subscriber by means of an electronic method or procedure in accordance with the provision of section 3 of Information Technology Act, 2000.

Digital signature is created in two steps. First, the electronic record is converted into a message digest by using a mathematical “hash function” which digitally freezes the electronic record thus ensuring the integrity of the content of the intended communication contained in the electronic record. Any tempering with the contents of the electronic record will immediately invalidate the digital signature. Secondly, the identity of the person affixing the digital signature is authenticated through the use of a private key which attaches itself to the message digest and which can be verified by anybody who has the public key corresponding to such private key. This will enable anybody to verify whether the electronic record is retained intact or has been tampered with since it was so fixed with the digital signature. It will also enable a person who has a public key to identify the originator of the message.

Section 35 of the Act lays down the procedure for issuance of a digital signature certificate.

