PAPER 9 - OPERATIONS MANAGEMENT & INFORMATION SYSTEM

The following table lists the learning objectives and the verbs that appear in the syllabus learning aims and examination questions:

	Learning objectives	Verbs used	Definition
LEVEL B	KNOWLEDGE What you are expected to know	List	Make a list of
		State	Express, fully or clearly, the details/facts
		Define	Give the exact meaning of
	COMPREHENSION What you are expected to understand	Describe	Communicate the key features of
		Distinguish	Highlight the differences between
		Explain	Make clear or intelligible/ state the meaning or purpose of
		Identity	Recognize, establish or select after consideration
		Illustrate	Use an example to describe or explain something
	APPLICATION How you are expected to apply your knowledge	Apply	Put to practical use
		Calculate	Ascertain or reckon mathematically
		Demonstrate	Prove with certainty or exhibit by practical means
		Prepare	Make or get ready for use
		Reconcile	Make or prove consistent/ compatible
		Solve	Find an answer to
		Tabulate	Arrange in a table
	ANALYSIS How you are expected to analyse the detail of what you have learned	Analyse	Examine in detail the structure of
		Categorise	Place into a defined class or division
		Compare and contrast	Show the similarities and/or differences between
		Construct	Build up or compile
		Prioritise	Place in order of priority or sequence for action
		Produce	Create or bring into existence

Paper 9 - Operations Management & Information System

Full Marks: 100   **Time allowed-3hrs**

This paper contains 3 questions. All questions are compulsory, subject to instruction provided against each question. All workings must form part of your answer. Assumptions, if any, must be clearly indicted.

Question No. 1 : Answer all questions. [20 marks]

1. **(a) Describe Repetitive focus.**
    (b) Explain the term 'worker-machine chart.'
    (c) 'A project starts with statement of work.'- Justify.
    (d) Compute the productivity per machine hour with the following data.

Month	No. of machines employed	Working Hours	Machine hours	Production Unit
March	400	220	88,000	99,000

     (e) Describe Maintenance Engineering.
     (f) Write a note on the human side of Technology Integration.
     (g) Program Design Language is also known as Structured English.- Why?
     (h) Describe Declarative.
     (i) Explain Cyber Crime.
     (j) Cost accounting module consists of some functionalities. List them.   **[10 × 2=20]**

Answer:

(a) A repetitive process is a product oriented production process that uses modules.
It falls between product focus and process focus. It uses modules which are parts or components prepared often in a continuous or mass production process.
A good example of repetitive process is the **assembly line** which is used for assembling automobiles and household appliances and is less flexible than process-focused facility.

(b) The man machine chart or worker-machine chart: This is a variation of multiple activity chart and illustrates the operation and delays of the operator and the machine which he operates. An example of man machine chart may be one worker running two machines simultaneously.

(c) Project planning deals with specified tasks, operations or activities, which must be performed to achieve project goals. A project starts with **statement of work**. It may be a written description of objectives (rules/regulations/ constraints/restriction) to be achieved with a brief statement of work to be done and a proposed schedule specifying the start and completion dates of the project.

(d) We know, p = productivity per machine hour.
               = Number of units produced/ Machine hours
               = 99,000/88,000 = 1.125

(e) Maintenance Engineering is that function of production management that is concerned with the day-to-day problems of keeping the physical plant in good operating condition.

(f) Technology determines how the jobs are done by people. When technology changes, jobs also will change. New technology may eliminate some jobs, add some jobs, upgrade or downgrade some other jobs. Employee training, education and involvement help a firm identify new technological possibilities and prepare employees for the new technologies.

(g) Structured English, also known as Program Design Language (PDL) or Pseudo Code, is the use of the English language with the syntax of structured programming. In structured English, Conditional blocks are indicated by keywords such as IF, THEN, and ELSE.

(h) A query in a high-level DML often specifies which data to retrieve rather than how to retrieve it; hence, such languages are also called **declarative**.

(i) **Cyber Crime** is not defined in Information Technology Act 2000 or in the I.T. Amendment Act 2008 or in any other legislation in India. In fact, it cannot be too. Offence or crime has been dealt with elaborately listing various acts and the punishments for each, under the Indian Penal Code, 1860 and quite a few other legislations too. In a cyber crime, computer or the data itself the target or the object of offence or a tool in committing some other offence, providing the necessary inputs for that offence. All such acts of crime will come under the broader definition of cyber crime.

(j) Cost accounting module consists of following functionalities:
   1. Overhead Cost controlling.
   2. Cost price calculation.
   3. Hours accounting.
   4. Activity based costing.

Operation Management

Answer any three questions

2. (a) (i) Describe the term Commercialisation in relation to planning of products. **[3]**
   (ii) List the benefits of Production Control. **[5]**
   (iii) With a view to improving the quality of customer services, a Bank is interested in making an assessment of the waiting time of its customers coming to one of its branches located in a residential area.This branch has only one teller's counter. The arrival rate of the customers and the service rate of the teller are given below:

Time between two consecutive arrivals of customers(in minutes)	Probability	Service Time by the teller (in minutes)	Probability
3	0.17	3	0.10
4	0.25	4	0.30
5	0.25	5	0.40
6	0.20	6	0.15
7	0.13	7	0.05

You are required to stimulate 10 arrivals of customers in the system starting from 10 AM and show the waiting time of the customers and idle time of the teller. Use the following random numbers taking the first two random numbers in two digits each for the first trial and so on:
11,56,23,72,94,83,83,01,97,99,83,10,93,34,33,53,49,94,37 and 97. **[8]**

(b) (i) Trucks arrive at a factory for collecting finished goods for transportation to distant markets. As and when they come they are required to join a waiting line and are served on first come, first served basis. Trucks arrive at the rate of 10 per hour whereas the loading rate is 15 per hour. It is also given that arrivals are Poisson and loading is exponentially distributed. Transporters have complained that their trucks have to wait for nearly 12 hours at the plant. Examine whether the complaint is justified. Also determine profitability that the loaders are idle in the above problem. **[6]**

(ii) An analyst has observed a job long enough to become familiar with it and has divided it into five elements. The element times for the first four cycles and a performance rating for each element are given in the following table:

Element	Cycle-1	Cycle-2	Cycle-3	Cycle-4	Performance Rating(%)
1	1.246	1.328	1.298	1.306	90
2	0.972	0.895	0.798	0.919	100
3	0.914	1.875	1.964	1.972	100
4	2.121	2.198	2.146	2.421	110
5	1.253	1.175	1.413	2.218	100

- Compute an estimated normal time for the job based on the data available at this stage of the study. **[4]**

(iii) A department works on 8 hours shift, 250 days a year and has the usage data of a machine, as given below:

Product	Annual demand (units)	Processing time (Standard time in hours)
A	600	4.0
B	800	6.0
C	1000	3.0

Determine the number of machines required. **[6]**

(c) (i) ABC airline operating 7 days a week has given the following time table. Crews must have a minimum layover of five hours between the flights. Obtain the pairing flights that minimize the layover time away from home. For any given pairing the crew will be based at the city that results in the smaller layover.

HYDERABAD - DELHI				HYDERABAD - DELHI		
Flight No.	Departure	Arrival		Flight No.	Departure	Arrival
A1	6 AM	8 AM		B1	8 AM	10 AM
A2	8 AM	10 AM		B2	9 AM	11AM
A3	2 PM	4 PM		B3	2 PM	4 PM
A4	8 PM	10 PM		B4	7 PM	9 PM

[12]

(ii) List the problems in Maintenance Scheduling. **[4]**

(d) (i) A city hospital has the following minimal daily requirement for nurses:

Period	Clock time (24 hours day)	Minimal number of nurses required
1	6 AM - 10 AM	2
2	10 AM - 2 PM	7

3	2 PM- 6 PM	15
4	6 PM-10 PM	8
5	10 PM – 2 AM	20
6	2 AM - 6 AM	6

Nurses report to the hospital at the beginning of each period and work for consecutive 8 hours. The hospital wants to determine the minimal number of nurses to be employed so that there will be sufficient number of nurses available for each period. Formulate LPP. Do not solve. [6]

(ii) **The following activities must be accomplished in order to complete a construction project:**

Activity	A	B	C	D	E	F	G	H	I	J
Time	3	8	4	2	1	7	5	6	8	9
Predecessors	—	—	AB	B	A	C	EF	DF	GH	I

- **Construct a network diagram for this project. Find the CP and the duration of the project.**
- **Assume that you are project manager of the project mentioned above. The project has progressed for 10 weeks and the status is follows:**

Activities completed: A, B, E. Other activities have not started as yet.

- ❖ **If no managerial action is taken at all when will the project get completed?**
- ❖ **What action might you take to get the project back to a schedule that can be completed by the end of week 42?** [5+5]

Answer:

(a) (i) In this stage the product is submitted to the market, and thus commences its life-cycle. Commercialisation is also the phase where marketing is most active in connection with the new product. This stage is considered to be a critical one for any new product and should therefore be handled carefully. For instance, it should be checked whether advertising and personal selling have been done effectively and whether proper outlets have been arranged for the distribution. Despite the care with which the previous development stages have been planned, unforeseen events can impair commercialisation seriously. The following activities are usually undertaken during this stage:
1. Completing final plans for production and marketing.
2. Initiating coordinated production and selling programmes.
3. Checking results at regular intervals.

It should be remembered that new products should be launched in the market only stage by stage. In other words, introduction may be restricted to a few regions in the first instance. This is to avoid short supply of the product due to initial gaps in production and distribution. It is not prudent to extend a product nationally and then not be able to meet demand or to come across some unexpected deficiency.

(ii) Benefits of Production Control
1. Improvement in profits through -
   (a) Maintenance of a balanced inventory of materials, parts, work-in-process and finished goods.
   (b) Balanced and stabilized production.
   (c) Maximum utilization of equipment, tooling, labour (manpower) and storage space.

(d) Minimum investment in inventory.
(e) Reduction in indirect costs.
(f) Reduction in set up costs.
(g) Reduction in scrap and rework costs.
(h) Reduction in inventory costs.

2. Competitive advantage-
   (a) Reliable delivery to customers.
   (b) Shortened delivery schedules to customers.
   (c) Lower production costs and greater pricing flexibility.
   (d) Orderly planning and marketing of new or improved products.

(iii) Probability Distribution (two consecutive customers)

Time between two customers' arrival(m)	Probability	Cum. Probability	Range	Rang for simulation
3	0.17	0.17	00 - 0.17	00 – 0.16
4	0.25	0.42	0.17 – 0.42	0.17 – 0.41
5	0.25	0.67	0.42 – 0.67	0.42 – 0.66
6	0.20	0.87	0.67 – 0.87	0.67 – 0.86
7	0.13	1.00	0.87 – 1.00	0.87 – 0.99

Probability Distribution (service time)

Service (m)	Probability	Cum. Probability	Range	Rang for simulation
3	0.10	0.10	00 – 0.10	00 – 0.09
4	0.30	0.40	0.10 – 0.40	0.10 – 0.39
5	0.40	0.80	0.40 – 0.80	0.40 – 0.79
6	0.15	0.95	0.80 – 0.95	0.80 – 0.94
7	0.05	1.00	0.95 – 1.00	0.95 – 0.99

Customer No.	Arrival time	Service begins	Service time	Service ends	Waiting time	Idle time
1	10.03 AM	10.03 AM	5 mins	10.08	-	3 mins
2	10.07	10.08	5 mins	10.13	1 min	-
3	10.14	10.14	6 mins	10.20	-	1 min
4	10.20	10.20	3 mins	10.23	-	-
5	10.27	10.27	7 mins	10.34	-	4 mins
6	10.33	10.34	4 mins	10.38	1 min	-
7	10.40	10.40	4 mins	10.44	-	2 mins
8	10.44	10.44	5 mins	10.49	-	-
9	10.49	10.49	6 mins	10.55	-	-
10	10.53	10.55	7 mins	11.02	2 mins	-
Total					4 mins	10 mins

(b) (i) Here we are given:
λ = 10 per hour, μ=15 per hour
Average waiting time in the queue

$$= \frac{\lambda}{\mu(\mu-\lambda)} = \frac{10}{15(15-10)} = \frac{10}{75} \text{ hr. or 8 mins}$$

In no way,can the claim be justified because waiting time is less than 12 hours. Now, the probability of loaders lying idle is:

$$P_O = 1 - \frac{\lambda}{\mu} = 10 - \frac{10}{15} = \frac{5}{15} \text{ or 33.33\%}$$

(ii)

Element	Mean actual time	Performance rating (%)	Normal time
1	1.295	90	1.165
2	0.896	100	0.896
3	1.681	100	1.681
4	2.222	110	2.444
5	1.512	100	1.512

Normal time for total job = 7.698

(iii) Step 1: Calculate the processing time needed in hours to produce product X, Y and Z in the quantities demanded using the standard time data.

Product	Annual demand(units)	Standard Processing time per unit (hrs.)	Processing time needed (hrs.)
A	600	4.0	600 x 4= 2,400
B	800	6.0	800 x 6= 4,800
C	1000	3.0	1000 x 3= 3,000
			Total= 10,200

Step 2 : Annual production capacity of one machine in standard hours = 8 × 250 = 2000 hours per year

Step 3 : Number of machines required = Work load per year/Production capacity per machine = 10,200/2000 = 5.1 machines = 5 machines.(approx)

(c) (i) Answer:

Layover time (Hyderabad based crew)					Layover time (Delhi based crew)				
Flight No.	**B1**	**B2**	**B3**	**B4**	**Flight No.**	**B1**	**B2**	**B3**	**B4**
A1	24	25	6	11	A1	20	19	14	9
A2	22	23	28	9	A2	22	21	16	11
A3	16	17	22	27	A3	18	27	22	17
A4	10	11	16	21	A4	10	9	28	23

Minimum time					Row subtraction				
Flight No.	**B1**	**B2**	**B3**	**B4**	**Flight No.**	**B1**	**B2**	**B3**	**B4**
A1	24	25	6	11	A1	20	19	14	9
A2	22	23	28	9	A2	22	21	16	11
A3	16	17	22	27	A3	18	27	22	17
A4	10	11	16	21	A4	10	9	28	23

As there is zero in each column, column subtraction is not required.

Minimum No. of lines

Flight No.	B1	B2	B3	B4
A1	14	13	0	3
A2	13	12	7	0
A3	0	1	6	1
A4	1	0	7	12

As the minimum number of lines are equal to order of matrix, optimal assignment should be made.

Optimal assignment

Flight No.	B1	B2	B3	B4
A1	14	13	[0]	3
A2	13	12	7	[0]
A3	[0]	1	6	1
A4	1	[0]	7	12

Pair	
A1- B3	6 hours at Delhi (Hyderabad based crew)
A2- B4	9 hours at Delhi (Hyderabad based crew)
A3- B1	16 hours at Delhi (Hyderabad based crew)
A4- B2	9 hours at Hyderabad (Delhi based crew)
Total	40 hours

(ii) Problems in Maintenance Scheduling
   (i)   Scheduling maintenance requires the prior concurrence of production personnel to release the machine or equipment for maintenance during a specified time. Hence, there should be proper cooperation and coordination between production department and maintenance department.
   (ii) Proper priority must be worked out to prepare scheduling of breakdown maintenance or preventive maintenance as per the importance of the machine or equipment and the effect of breakdown and consequent machine down time on production.
   (iii) Dovetailing of maintenance and production schedules is difficult.
   (iv) Preventive maintenance schedules must be prepared for at least two weeks and circulated well in advance to production departments to get their consent before finalising the schedule.

(d) (i) Let the number of nurses reporting at 6 AM = x_1
Let the number of nurses reporting at 10 AM = x_2

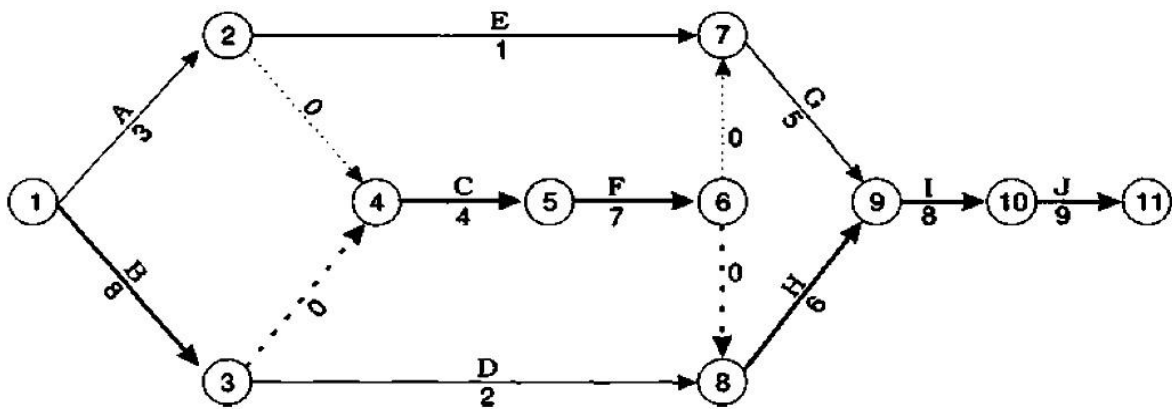Let the number of nurses reporting at 2 PM = x_3

Let the number of nurses reporting at 6 PM = x_4

Let the number of nurses reporting at 10 PM = x_5

Let the number of nurses reporting at 2 AM = x_6

Objective function: Minimize $x_1 + x_2 + x_3 + x_4 + x_5 + x_6$.			
Subject to: →	(i) $x_6 + x_1 \geq 2$	(ii) $x_1 + x_2 \geq 7$	(iii) $x_2 + x_3 \geq 15$
(iv) $x_3 + x_4 \geq 8$	(v) $x_4 + x_5 \geq 20$	(vi) $x_5 + x_6 \geq 6$	(vii) $x_1, x_2\ x_3, x_4, x_5, x_6 \geq 0$

(ii)

Paths	Duration (weeks	Paths	Duration (weeks)
1-2-7-9-10-11	26	1-3-4-5-6-7-9-10-11	41
1-2-4-5-6-7-9-10-11	36	1-3-4-5-6-8-9-10-11	42
1-2-4-5-6-8-9-10-11	37	1-3-8-9-10-11	33
Critical Path: BCFHIJ. Duration 42 weeks.			
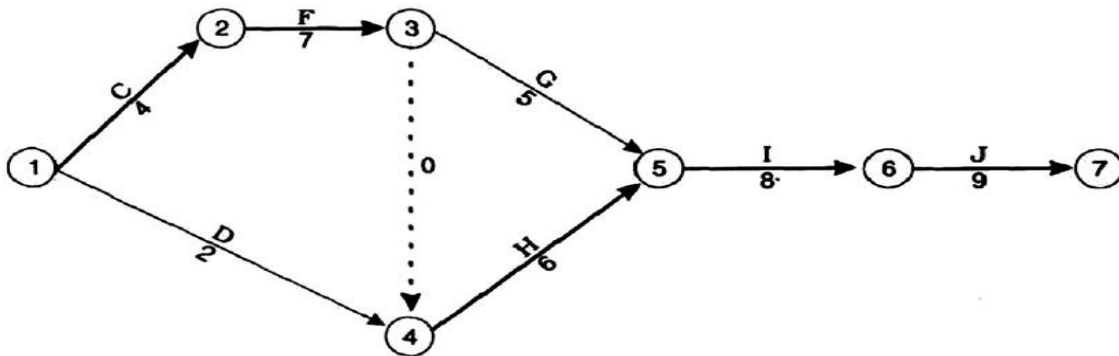
Paths	1-2-3-5-6-7	1-2-3-4-5-6-7		1-4-5-6-7
Duration (weeks)	33	34	**Critical Path: CFHIJ**	25

For completing the project as per original schedule, the project activities on the critical path should be reduced by 2 weeks. For example, we may reduce any one of the activities CFHIJ by 2 days or any two activities or one reek each.

Information System

Answer any two questions.

3. **(a) (i) Discuss the various fact-finding techniques used by the system analysts for determining the needs/requirements of an organization.** **[4]**
   (ii) List the categories of tests that a programmer performs on a program unit. **[5]**
   (iii) State the pre-requisites of an effective Management Information System (MIS). **[4]**
   (iv) Define query compiler. **[3]**

   (b) (i) List the categories of Goods Movement. **[5]**
   (ii) "There are other implications of using the database approach that can benefit most organizations." –Justify. **[6]**
   (iii) Describe the activities involved in conversion. **[5]**

   (c) (i) State the main goals of E-commerce. **[3]**
   (ii) List the benefits of Electronic Data Interchange. **[5]**
   (iii) Explain the term E-banking. **[5]**
   (iv) "Price fixation is one of the advantages of E-commerce". – Justify. **[3]**

Answer:

(a) (i) Various fact-finding techniques, which are used by the system analyst for determining the needs/requirements of an organization are briefly discussed below :
   (i) Documents: Analysts collect the hierarchy of users and manager responsibilities, job descriptions for the people who work with the current system, procedure manuals, program codes for the applications associated with the current system to understand the existing system.
   (ii) Questionnaires: Users and managers are .asked to complete questionnaire about the problems with the existing system and requirement of the new system. Using questionnaires, a large amount of data can be collected fastly.
   (iii) Interviews: Users and managers may also be interviewed to extract information in depth.
   (iv) Observation: Observation plays a key role in requirement analysis. Only by observing how users react to prototypes of a new system, the system can be successfully developed.

   (ii) There are five categories of tests that a programmer typically performs on a program unit:
   • **Functional Tests:** As per this plan programmer checks by inputting the values to see whether the actual result and expected result match. The test plan tests the operating conditions.

- **Performance Tests:** Performance Tests should be designed to verify the response time, the execution time, the throughput in providing the requirements made by users.
- **Stress Tests:** It involves testing beyond normal operational capacity in order to observe the results. These tests are designed to overload a program in various ways. The purpose of a stress test is to determine the limitations of the program.
- **Structural Tests:** Structural Tests are concerned with examining the internal processing logic of a software system, whether the processing is correctly made as per the logic given.
- **Parallel Tests:** In Parallel Tests, the same test data is used in the new and old system and the output results are then compared.

(iii) The following are pre-requisites of an effective MIS:
- **Database -** The data in database is organised in such a way that access to the data is improved and redundancy is reduced. Such a database is capable of meeting information requirements of its executives, which is necessary for planning, organising and controlling the operations of the business.
- **Qualified System and Management Staff -** MIS should be managed by qualified officers. The organizational management base should comprise of two categories of officers (i) System and Computer experts and (ii) Management experts
- **Support of Top Management -** A MIS becomes effective only if it receives the full support of top management. To gain the support of top management, the officer should place before them all the supporting facts and state clearly the benefits which will accrue from it to the organization.
- **Control and Maintenance of MIS-** Sometimes users develop their own procedures or shortcut methods to use the system, which reduces its effectiveness. Maintenance is closely related to control.

(iv) The **query compiler** handles high-level queries that are entered interactively. It parses, analyzes, and compiles or interprets a query by creating database access code, and then generates calls to the run-time processor for executing the code.

(b) (i) The categories of Goods Movement are listed below:
Goods receipt
A goods receipt (GR) is a goods movement with which the receipt of goods from a vendor or from production is posted. A goods receipt leads to an increase in warehouse stock.
Goods issue
A goods issue (GI) is a goods movement with which a material withdrawal or material issue, a material consumption, or a shipment of goods to a customer is posted. A goods issue leads to a reduction in warehouse stock.
Stock transfer
A stock transfer is the removal of material from one storage location and its transfer to another storage location. Stock transfers can occur either within the same plant or between two plants.
Transfer posting
A transfer posting is a general term for stock transfers and changes in stock type or stock category of a material. It is irrelevant whether the posting occurs in conjunction with a physical movement or not.

Examples of transfer postings are:
- Transfer postings from material to material

- Transfer from quality inspection stock to Unrestricted stock
- Transfer of consignment material into company's own stock

(ii) There are other implications of using the database approach that can benefit most organizations.

Potential for Enforcing Standards: The database approach permits the DBA to define and enforce standards among database users in a large organization. This facilitates communication and cooperation among various departments, projects, and users within the organization. Standards can be defined for names and formats of data elements, display formats, report structures, terminology, and so on. The DBA can enforce standards in a centralized database environment more easily than in an environment where each user group has control of its own files and software.

Reduced Application Development lime: A prime selling feature of the database approach is that developing a new application—such as the retrieval of certain data from the database for printing a new report—takes very little time. Designing and implementing a new database from scratch may take more time than writing a single specialized file application. However, once a database is up and running, substantially less time is generally required to create new applications using DBMS facilities. Development time using a DBMS is estimated to be one-sixth to one-fourth of that for a traditional file system.

Flexibility: It may be necessary to change the structure of a database as requirements change. For example, a new user group may emerge that needs information not currently in the database. In response, it may be necessary to add a file to the database or to extend the data elements in an existing file. Modern DBMSs allow certain types of changes to the structure of the database without affecting the stored data and the existing application programs.

Availability of Up-to-Date Information: A DBMS makes the database available to all users. As soon as one user's update is applied to the database, all other users can immediately see this update. This availability of up-to-date information is essential for many transaction-processing applications, such as reservation systems or banking databases, and it is made possible by the concurrency control and recovery subsystems of a DBMS.

Economies of Scale: The DBMS approach permits consolidation of data and applications, thus reducing the amount of wasteful overlap between activities of data-processing personnel in different projects or departments. This enables the whole organization to invest in more powerful processors, storage devices, or communication gear, rather than having each department purchase its own (weaker)equipment. This reduces overall costs of operation and management.

(iii) Activities involved in conversion: These activities are classified as follows:

(a) Procedure conversion: Operating procedures should be completely documented for the new system. Brief meetings must be held when changes are taking place in order to inform all operating employees of any changes initiated.

(b) File conversion: Because large files of information must be converted from one medium to another. In order for the conversion to be as accurate as possible, file conversion programs must be thoroughly tested. Adequate controls, such as record counts and control totals, should be the required output of the conversion program.

(c) System conversion: A cutoff point is established so that data base and other data requirements can be updated to the cutoff point. All transactions initiated after this time are processed on the new system.

Consideration should be given to operating the old system for some more time to permit checking and balancing the total results of both systems.

(d) Scheduling personnel and equipment: Some programs might be operational while others will be in various stages of compiling and testing. Schedules should be set up by the system manager in conduction with departmental managers of operational units.

(e) Alternative plans in case of equipment failure: Alternative-processing plans must be implemented in case of equipment failure. Priorities must be given to those jobs critical to an organization, such as billing, payroll, and inventory. Critical jobs can be performed manually until the equipment is set right.

(c) (i) It helps in achieving following goals
  (i) Reach new markets.
  (ii) Create new products or services.
  (iii) Build customer loyalty.
  (iv) Enrich human capital.
  (v) Make the best use of existing and emerging technologies.
  (vi) Achieve market leadership and competitive advantage.

(ii) EDI has following benefits:
  (i) The use of EDI eliminated many problems associated with traditional information flow such as the delay associated with making of documents.
  (ii) As data is not repeatedly keyed (typed) therefore the chances of error are reduced.
  (iii) Time required to re-enter data is saved.
  (iv) As data is not re-entered at each step in the process, therefore labour costs are reduced.
  (v) As time delays are reduced therefore more certainty in information flow is there.
  (vi) EDI generates functional acknowledgement that the EDI message has been received by the
  (vii) recipient and is electronically transferred to sender. Therefore this acknowledgement which is
  (viii) sent electronically by the recipient to sender, states that the message has been received.

(iii) Online banking (or **Internet banking** or **E-banking**) allows customers of a financial institution to conduct financial transactions on a secure website operated by the institution, which can be a retail or virtual bank, credit union or building society. It may include of any transactions related to online usage.
To access a financial institution's online banking facility, a customer having personal Internet access must register with the institution for the service, and set up some password (under various names) for customer verification. The password for online banking is normally not the same as for telephone banking. Financial institutions now routinely allocate customer numbers (also under various names), whether or not customers intend to access their online banking facility. Customer numbers are normally not the same as account numbers, because a number of accounts can be linked to the one customer number. The customer will link to the customer number any of those accounts which the customer controls, which may be cheque, savings, loan, credit card and other accounts.
To access online banking, the customer would go to the financial institution's website, and enter the online banking facility using the customer number and password. Some

financial institutions have set up additional security steps for access, but there is no consistency to the approach adopted.

(iv) The day-to-day pressures of the marketplace have played their part in reducing the opportunities for companies to invest in improving their competitive position. A mature market, increased competitions have all reduced the amount of money available to invest. If the selling price cannot be increased and the manufactured cost cannot be decreased then the difference can be in the way the business is carried out. E-commerce has provided the solution by decimating the costs, which are incurred.