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.

1. Answer all questions: **[10×2 = 20]**

(a) Define Quality Control.

(b) State the meaning of Facility Loading.

(c) A steel plant has a designed capacity of 50,000 tons of steel per day, effective capacity of 40,000 tons of steel per day and an actual output of 36,000 tons of steel per day. Compute the efficiency of the plant and its utilization.

(d) State the three fundamental concepts of JIT.

(e) 'Six Sigma provides flexibility in the new millennium of 3C's' – List them.

(f) The main shaft of an equipment has a very high reliability of 0.990. The equipment comes from Russia and has a high downtime cost associated with the failure of this shaft. This is estimated at ₹2 crore as the costs of sales lost and other relevant costs. However, this spare is quoted at ₹10 lakh at present. Should the shaft spare be procured along with the equipment and kept or not?

(g) Discuss Operational level Information System.

(h) Name the different Entity Relationship Models.

(i) State the characteristics of good quality information.

(j) Define the term 'Data'.

Answer:

(a) Quality Control may be defined as 'a system that is used to maintain a desired level of quality in a product or service'. It is a systematic control of various factors that affect the quality of the product. Quality Control aims at prevention of defects at the source, relies on effective feedback system and corrective action procedure.

(b) Facility loading means loading of facility or work centre and deciding which jobs to be assigned to which work centre or machine. Loading is the process of converting operation schedules into practice.

(c) Efficiency of the plant = Actual output / Effective Capacity

= 36,000 / 40,000 × 100 = 90%

Utilisation = Actual output/Design Capacity

= 36,000 / 50,000 × 100 = 72%

(d) The three fundamental concepts of JIT are:

(i) Elimination of waste and variability

(ii) "Pull" versus "Push" system and

(iii) Manufacturing cycle time (or "throughput" time).

(e) Six Sigma provides flexibility in the new millennium of 3C's which are:

- Change: Changing society
- Customer: Power is shifted to customer and customer demand is high
- Competition: Competition in quality and productivity.

(f) The expected cost of down-time

= (Probability of failure) × (Cost when break-down occurs)

= (1 - 0.990) × (₹ 2 crore) = ₹2 lakh

However, the cost of procuring the spare now is ₹10 lakh. Therefore, expected cost of downtime is less than the cost of spare; hence the spare need not be bought along with the equipment.

(g) Operational-level Information Systems are typically transaction processing systems and help in the operational level managers to keep track of elementary activities and transactions of the organisations such as sales, receipts, cash deposits, flow of materials etc.

(h) Entity Relationship Models

- Mandatory Relationships
- Optional Relationships
- Many-to-Many Relationships
- One-to-Many Relationships
- One-to-One Relationships
- Recursive Relationships

(i) The characteristics of good quality information should be:

- Accurate
- Up-to-date
- Relevant
- Complete
- On-time
- Appropriately presented
- Intelligible

(j) "Data" - A representation of information, knowledge, facts, concepts or instructions which are being prepared or have been prepared in a formalized manner, and is intended to be processed, is being processed or has been processed in a computer system or computer network, and may be in any form (including computer printouts magnetic or optical storage media, punched cards, punched tapes) or stored internally in the memory of the computer.

Operations Management

2. Answer any three questions:

2. (a) (i) Discuss the needs for operation research. [6]

(ii) A manufacturing enterprise has introduced a bonus system of wage payment on a slab-rate based on cost of production towards labour and overheads.

The slab-rate being

Between 1% - 10%	**Saving in production cost**	**5% of saving**
Between 11%-20%	**Saving in production cost**	**15%**
Between 21%-40%	**Saving in production cost**	**30%**
Between 41%-70%	**Saving in production cost**	**40%**
Above 70%	**Saving in production cost**	**50%**

The rate per hour for three workers A, B, C are ₹5, ₹5.50 and ₹5.25 respectively. The overhead recovery rate is 500% of production wages and the material cost is ₹40 per unit. The standard cost of production per unit is determined at ₹160 per unit.

If the time taken by A, B, C to finish 10 units is 26 hours, 30 hours and 16 hours respectively, what is the amount of bonus earned by the individual workers and actual cost of production per unit? [6]

(iii) Write a note on Quality Circle membership. [4]

Answer:

(i) A list of various needs of Operations Research is given below:

- Operations Research requires business managers to be quite explicit about their objectives, their assumptions and the way of visualizing the constraints. When they define their problem so explicitly, the solution obtained using Operations Research techniques will be very precise.
- Using Operations Research approach the decision maker can determine a solution to his routine or repetitive problem. For obtaining solution of such type of problems, it is necessary to build a model so that future solutions can be obtained using the model thus freeing managers to concentrate on more pressing matters. Only when unusual circumstances arise, they are required to review the situation. In this way, they can achieve better control of their operations and can allocate their time more efficiently.
- While using Operations Research approach, a manager has to consider very carefully all those variables which influence his decisions and the way these variables in a problem interact with each other. He then selects a decision which is best for the organization as whole.

- Using Operations Research approach a decision-maker can examine a situation from various angles by simulating the model which he has constructed for the real problem. He can change various conditions under which decisions are being made, and examine the effect of these changes through appropriate experiments on the model, to determine the best or optimal solution for the problem under consideration. All these experiments can be carried out without causing any serious damage to the existing system or incurring excessive cost.
- Operations Research approach allows a decision maker to solve a complex problem involving multiple variables much more quickly than if he had to compute them using traditional methods. Sometimes it may not be possible to solve such complex problems without using Operations Research methods.
- Operations Research techniques are gaining acceptance and respect day by day as they improve manager's decision making effectiveness.

(ii)

Particulars	A	B	C
Unit produced	10	10	10
Wage rate/hr.	5.00	5.50	5.25
Time taken	26 hours	30 hours	16 hours
Wage payable	130.00	165.00	84.00
Overhead recovery	650.00	825.00	420.00
Materials	400.00	400.00	400.00
Total cost of production	1,180.00	1,390.00	904.00
Standard cost of production	1,600.00	1,600.00	1,600.00
Saving in cost of production	420.00	210.00	696.00
% of savings	26.25%	13.13%	43.50%
Bonus slab	30%	15%	40%
Bonus Amount	126.00	31.50	278.40
Actual cost of production	1,306.00	1,421.50	1,182.40
Cost/unit (₹)	130.60	142.15	118.24

(iii) Quality Circle membership

QC members elect their leader and deputy leader and name their circle. They also decide about meeting place, time and day.

Quality circle then discuss the problems of their work area and arrive at some agreed upon solution. The management is then informed about the presentation. At the time of presentation every member is given a chance.

If the recommendations of QC are accepted by the management, then it is the responsibility of the circles to implement and monitor it.

As a rule of thumb, the meeting takes place once a week and each meeting lasts for approximately one hour. It is preferable to conduct the meetings in a separate room in the same work area or very close to the work area. It is advisable to allow the members to conduct the meeting in company's time in order to get full participation in circle meeting.

2. (b) (i) Write the elements of preventive maintenance. [5]

(ii) Frontier Bakery keeps stock of a particular brand of cake. Daily demand based on past experience is as given below:

Experience indicates:

Daily demand	0	15	25	35	45	50
Probability	0.01	0.15	0.20	0.50	0.12	0.02

Consider the sequence of random number:

48	78	09	51	56	77	15	14	68	09

Using the sequence, simulate the demand for the next 10 days. [6]

(iii) State the guiding principles of Total Productive Maintenance(TPM) Programs. [5]

Answer:

(i) Elements of Preventive Maintenance

(a) An inventory of all plant and equipment.

(b) A classification of equipment and machinery as very important (Class A), Essential (Class B) Important (Class C) and not important (Class D) machines to determine their relative importance and priority for preventive maintenance sequence.

(c) A well designed inspection system.

(d) A good lubrication system which includes regular cleaning of equipment and machines, putting grease or lubricating oil as per the recommendations given in maintenance manuals.

(e) Maintenance of records of maintenance work carried in the past.

(f) Planning of maintenance work.

(g) Controlling of maintenance stores and spare parts inventory.

(h) Organisation (inspectors and maintenance crew) for preventive maintenance programme.

(i) Replacement of worn-out-parts and other parts showing signs of failure, before the machine or equipment actually breaks down.

(j) Provision of stand-by machines for critical equipment.

(ii)

Daily Demand	Probability	Cum. Probability	Cumulative Probability Range	Range for Simulation
0	0.01	0.01	0-0.01	0-0
15	0.15	0.16	0.01-0.16	0.01-0.15
25	0.20	0.36	0.16-0.36	0.16-0.35
35	0.50	0.86	0.36-0.86	0.36-0.85
45	0.12	0.98	0.86-0.98	0.86-0.97
50	0.02	1.00	0.98-1.00	0.98-0.99

Simulation of demand for next 10 days

Days	1	2	3	4	5	6	7	8	9	10
Demand	35	35	15	35	35	35	15	15	35	15

(iii) Guiding Principles of TPM Programs

(i) Maximise equipment effectiveness by reducing down time to zero.

(ii) Establish a thorough system of preventive maintenance for entire life span of equipment from design and acquisition to disposal.

(iii) Implement maintenance program in all organizational areas such as engineering, operation, facility management and maintenance, to spread TPM through the system.

(iv) Involve every single member of the organisation from top managers to workers on the shop floor.

(v) Assign responsibility for preventive maintenance to small, autonomous groups of employees rather than managers.

2. (c) (i) The captain of a cricket team has to allot five middle batting positions to five batsmen. The average runs scored by each batsman at these positions are as follows:

Batsman	BATTING POSITIONS				
	I	II	III	IV	V
P	40	40	35	25	50
Q	42	30	16	25	27
R	50	48	40	60	50
S	20	19	20	18	25
T	58	60	59	55	53

(I) Find the assignment of batsmen to positions, which would give the maximum number of runs.

(II) If another batsman 'U' with the following average runs in batting positions as below is added to the team, should he be included to play in the team? If so, who will be replaced by him?

Batting Position	I	II	III	IV	V
Average runs	45	52	38	50	49

[10]

(ii) XYZ manufacturing company Is using a machine whose purchase price is ₹ 65,000. The installation charges amount to ₹ 18,000 and the machine has a scarp value of only ₹ 8,000 because, the firm has a monopoly of this type of work. The maintenance cost in various years is given in the following table:

Year	1	2	3	4	5	6	7	8	9
Cost (₹)	1250	3750	5000	7500	10,500	14,500	20,000	24,000	30,000

Determine after how many years should the machine be replaced on economic considerations, assuming that the machine replacement can be done only at the year ends [6]

Answer:

(i)

(I) Opportunity Loss matrix

Batsman	BATTING POSITIONS				
	I	II	III	IV	V
P	20	20	25	35	10
Q	18	30	44	35	33
R	10	12	20	0	10
S	40	41	40	42	35
T	2	0	1	5	7

Row Subtraction

Batsman	BATTING POSITIONS				
	I	II	III	IV	V
P	10	10	15	25	0
Q	0	12	26	17	15
R	10	12	20	0	10
S	5	6	5	7	0
T	2	0	1	5	7

Column Subtraction

Batsman	BATTING POSITIONS				
	I	II	III	IV	V
P	10	10	14	25	0
Q	0	12	25	17	15
R	10	12	19	0	10
S	5	6	4	7	0
T	2	0	0	5	7

Minimum No. of lines

Batsman	BATTING POSITIONS				
	I	II	III	IV	V
P	10	10	14	25	0
Q	~~0~~	~~12~~	~~25~~	~~17~~	~~15~~
R	10	12	19	0	10
S	5	6	4	7	0
T	~~2~~	~~0~~	~~0~~	~~5~~	~~7~~

As the minimum numbers of lines are not equal to order of matrix, let's take steps to increase the number of zeros.

Batsman	BATTING POSITIONS				
	I	II	III	IV	V
P	6	6	10	25	0
Q	0	12	25	21	19
R	6	8	15	0	10
S	1	2	0	7	0
T	2	0	0	9	11

Minimum No. of lines

Batsman	BATTING POSITIONS				
	I	II	III	IV	V
P	6	6	10	25	0
Q	0	12	25	21	19
R	6	8	15	0	10
S	1	2	0	7	0
T	2	0	0	9	11

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

Optimal assignment

Batsman	BATTING POSITIONS				
	I	II	III	IV	V
P	6	6	10	25	[0]
Q	[0]	12	25	21	19
R	6	8	15	[0]	10
S	1	2	[0]	7	0
T	2	[0]	0	9	11

Maximum runs

Batsman	Position	Runs
P	V	50
Q	I	42
R	IV	60
S	III	20
T	II	60
Total		232

(II)

Batsman	I	II	III	IV	V	Dummy
P	40	40	35	25	50	0
Q	42	30	In	25	27	0
R	50	48	40	60	50	0
S	20	19	20	18	25	0
T	58	60	59	55	53	0
U	45	52	38	50	49	0

Opportunity Loss Matrix

Batsman	I	II	III	IV	V	Dummy
P	20	20	25	35	10	60
Q	18	30	44	35	33	60
R	10	12	20	0	10	60
S	40	41	40	42	35	60
T	2	0	1	5	7	60
U	15	8	22	10	11	60

Row Subtraction

Batsman	I	II	III	IV	V	Dummy
P	10	10	15	25	0	50
Q	0	12	26	17	15	42
R	10	12	20	0	10	60
S	5	6	5	7	0	25
T	2	0	1	5	7	60
U	7	0	14	2	3	52

Column Subtraction

Batsman	I	II	III	IV	V	Dummy
P	10	10	14	25	0	25
Q	0	12	25	17	15	17
R	10	12	19	0	10	35
S	5	6	4	7	0	0
T	2	0	0	5	7	35
U	7	0	13	2	3	27

Minimum No. of lines

Batsman	I	II	III	IV	V	Dummy
P	10	10	14	25	0	25
Q	0	12	25	17	15	17
R	10	12	19	0	10	35
S	5	6	4	7	0	0
T	2	0	0	5	7	35
U	7	0	13	2	3	27

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

Optimum assignment

Batsman	I	II	III	IV	V	Dummy
P	10	10	14	25	[0]	25
Q	[0]	12	25	17	15	17
R	10	12	19	[0]	10	35
S	5	6	4	7	0	[0]
T	2	0	[0]	5	7	35
U	7	[0]	13	2	3	27

Maximum runs

Batsman	Position	Runs
P	V	50
Q	I	42
R	IV	60

S	Dummy	--
T	III	59
U	II	52
Total		263

U will replace S.

(ii) Here, we are given:

Cost of machine, C = ₹ 65,000 + ₹ 18,000 = ₹ 83,000

Scrap value, S = ₹ 8,000.

TABLE : Determination of Optimal Replacement Period

Year	Maintenance cost	Cum. Main. cost	Depreciation	Total cost	Average cost per year
	M(t)	ΣM(t)	C - S	TC_n	ATC_n
(1)	(2)	(3)	(4)	(5)=(3)+(4)	(6)
1	1,250	1,250	75,000	76,250	76,250.0
2	3,750	5,000	75,000	80,000	40,000.0
3	5,000	10,000	75,000	85,000	28,333.3
4	7,500	17,500	75,000	92,500	23,125.0
5	10,500	28,000	75,000	1,03,000	20,600.0
6	14,500	42,500	75,000	1,17,500	19,583.3*
7	20,000	62,500	75,000	1,37,500	19,642.9
8	24,000	86,500	75,000	1,61,500	20,187.5
9	30,000	1,16,500	75,000	1,91,500	21,277.8

From the above table, we find that the lowest average cost is ₹ 19,583.3 which corresponds to the sixth year. Hence, the machine may be replaced after every 6 years.

2. (d) (i) ORTIS INVESTMENT MANAGEMENT LTD. (a Mutual Fund company) has ₹40 lakh available for investment in Government Bonds, Blue Chip Stocks, Speculative Stocks and Short Term Deposits. The annual expected return and risk factor are given below:

Type of investment	Annual Expected	Risk Factor
Return (%)	**(0 to 100)**	
Government bonds	**12**	**12**
Blue chip Stocks	**20**	**24**
Speculative Stocks	**25**	**50**
Short terms Deposits	**8**	**5**

The Company (OIML) is required to keep at least ₹ 5 lakh in short term deposits and not to exceed average risk factor of 40. Speculative stocks must be at most 25% of the total amount invested.

Required:

How should ORTIS INVESTMENT MANAGEMENT LTD. invest the funds so as to maximize its total expected Annual Return?

Formulate this as a Linear Programming Problem. You are not required to solve the L.P.P. **[8]**

(ii) Draw the network for the following activities and find critical path and total duration of project:

Activity	Duration (months)	Activity	Duration (months)
1-2	2	4-7	3
1-3	2	5-8	1
1-4	1	6-8	4
2-5	4	7-9	5
3-6	5	8-9	3
3-7	8		

[8]

Answer:

(i) Let the amount invested in the securities be as follows –

Government Bonds = X1

Blue Chip Security = X2

Speculative Stocks = X3

Short Term Deposits = X4

These investments are subject to the following conditions –

Condition – 1:

Total Investment cannot exceed ₹ 40 lakhs

X1 + X2 + X3 + X4 ≤ 40 lakhs

Condition – 2:

Total investment in short term deposits is ₹ 5 lakhs

X4 ≤ 5 lakhs

Condition – 3:

Average risk factor should not exceed 40

i.e., $\frac{0.12 X 1 + 0.24 X 2 + 0.50 X 3 + 0.05 X 4}{4} \leq 40$

Condition – 4:

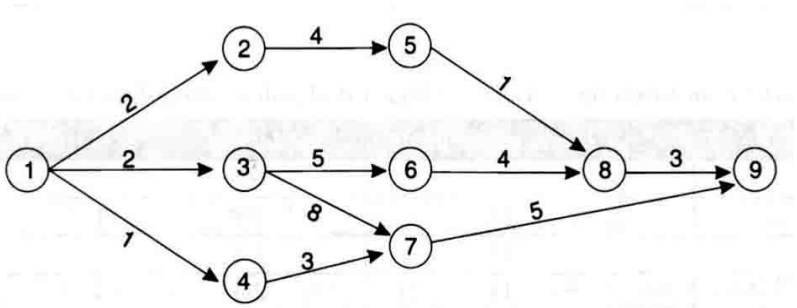
Investment in speculative stock shall not exceed 25% of total amount invested

i.e., X3 ≤ 25% × (X1 + X2 + X3 + X4)

The objective function here is to maximize the profit –

i.e., Z max = 0.12 X 1 + 0.20 X 2 + 0.25 X 3 + 0.08 X 4

(ii)



Paths	1-2-5-8-9	1-3-6-8-9	1-3-7-9	1-4-7-9
Duration	2+4+1+3 = 10	2 + 5 + 4 + 3 =14	2+8+5 = 15	1+3+5 = 9
The **critical path is 1-3-7-9.** Its duration is 15 months.				

Information System

3. Answer any two questions:

3. (a) (i) Discuss the areas which would help in analyzing/investing the present system. [7]

(ii) Differentiate between open and closed systems. [4]

(iii) List the advantages of the successful implementation of an ERP system. [5]

Answer:

(i) The following areas would help in analyzing/investing the Present System:

(a) Review historical aspects: A review of annual reports and organization chart can identify the hierarchy of management levels. The historical facts should identify the major turning points that have influenced its growth. The system analyst should also investigate what system changes have occurred in the past.

(b) Analyze inputs: Source documents are used to capture the originating data. The system analyst should study in depth various sources from where the data are initially captured to understand the existing system. The system analyst must understand the nature of each form, the distribution of the form.

(c) Review data files maintained: The analyst should investigate the data files maintained by each department and should know where they are located, who uses them. System and procedural manual should also be checked.

(d) Review methods, procedures and data communications : System analyst must review the types of data communication equipments including data interface, data links, modems, dial-up and leased lines and multiplexers to understand how the data communication network is used in the present system. A procedure's review is an intensive survey of the methods by which each job is accomplished, the equipment utilized and the actual location of the operations.

(e) Analyze outputs: The outputs or reports should be scrutinized carefully by the system analysts in order to determine whether they meet the organization's needs.

(f) Review internal controls: A review of the present system of internal controls may indicate weaknesses that should be removed in the new system. Locating the control points helps the analyst to visualize the essential parts and framework of a system.

(g) Undertake overall analysis of present system: Based upon the aforesaid investigation of the present information system, the final phase of the detailed investigation includes the analysis of the present work volume, the current personnel requirements, the present benefits and costs and each of these must be investigated completely.

(ii) Differentiation between open and closed systems:

Open systems actively interact with their environment. Such systems regularly get inputs and give outputs to its environment. Open systems are also able to adapt to environmental changes for their survival and growth. Business organization is an example of such system. Marketing System is an open system. The system takes inputs/feedbacks and gives outputs to its environment by way of giving products of the company and also creates new customers.

A closed system is self contained and does not interact or make exchange across its boundaries with its environment. Closed systems do not get the feedback they need from the external environment and tend to deteriorate eventually. For example, if a marketing system does not get feedback from the market, its efficiency will gradually continue to decrease. It is not subject to disturbances from its environment. A computer program can be taken as an example of relatively closed system because, it accepts only previously defined inputs, processes them and provides previously defined outputs and it does not change with the change in environment.

(iii) Advantages of the successful implementation of an ERP system

Business integration and Improved Data Accuracy: ERP system is composed of various modules/ sub modules where a module represents a particular business component. If data is entered in one module such as receiving, it automatically updates other related modules such as accounts payable and inventory. This updating occurs at real time i.e. at the time a transaction occurs. Since, data needs to be entered only once at the origin of transaction, the need of multiple entries of the same data is eliminated. Likelihood of duplicate/ erroneous data is, therefore, minimized. The centralized structure of the data base also enable better administration and security provisions, which minimizes loss of sensitive data.

Planning and MIS: The various decision support tools like planning engines and simulations functions, form integral part of an ERP system which helps in proper utilization of resources like materials, human resources and tools. Constrained based planning help in drawing appropriate production schedules, thereby improving operation of plant and equipment. As a part of MIS, an ERP system contains many inbuilt standard reports and also a report writer which produce ad hoc reports, as and when needed.

Improved Efficiency and Productivity: In addition to provision of improved planning, ERP system provides a tremendous boost to the efficiency of day to day and routine transactions such as order fulfilment, on time shipment, vendor performance, quality management, invoice reconciliation, sales realization, and cash management. Cycle time is reduced for sales to cash and procurement to pay sequences.

Establishment of Standardized Procedures: ERP system is based on processes of international best practices, which are adopted by the organizations during implementation. Department silos are purged and maverick practices are done away with. Because of top down view available to management, chances of theft, fraud and obsolescence are minimized.

Flexibility and technology: Due to globalized environment, where production units, distribution centers and corporate offices reside in different countries, organizations need multi currency, multi language and multi accounting modes, in an integrated manner. These provisions are available in most of the ERP systems, particularly in products offered by tier 1 and tier 2 vendors. ERP vendors are also quick to adopt latest technologies, from mainframe to client server to internet. Unlike a bespoke system, Upgrading to latest technology for a running ERP system is uncomplicated, involving mostly adoption of service packs and patches.

3. (b) (i) Discuss the needs of integration of information. [6]

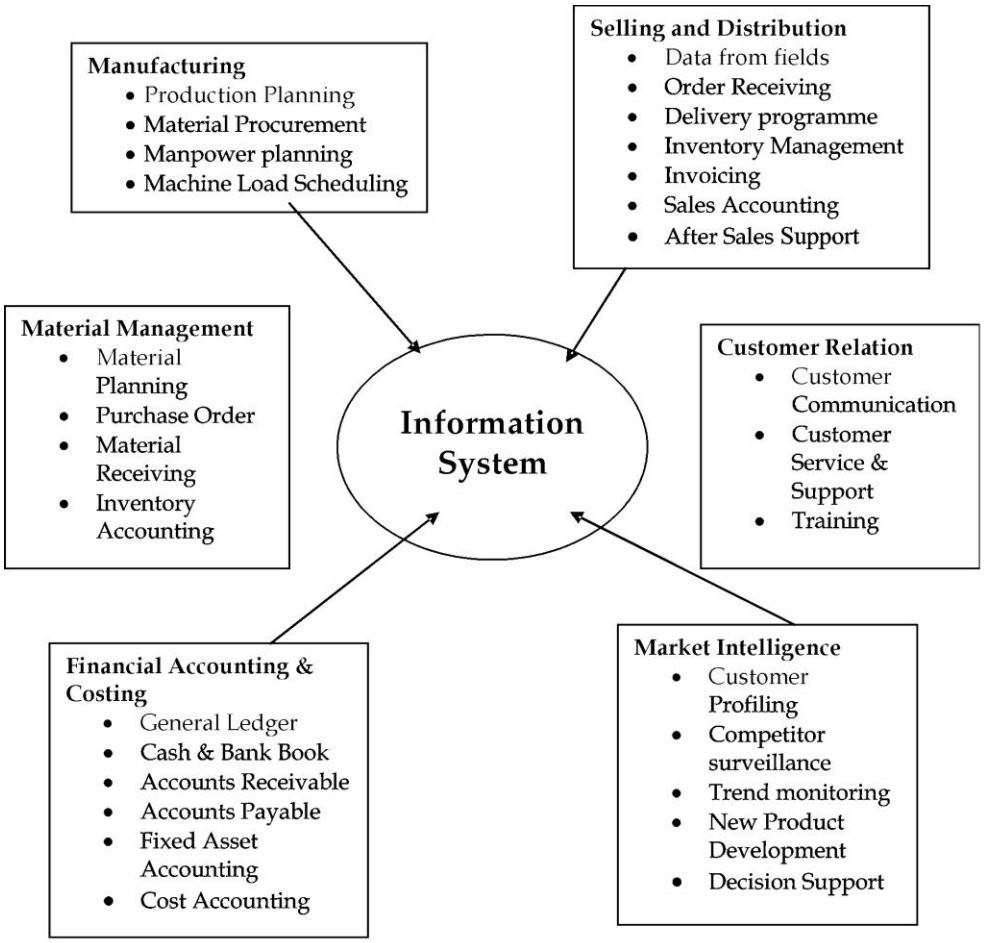
(ii) State the pre-requisites of an MIS. [4]

(iii) Explain the workers behind the scene. [6]

Answer:

(i) The following are the needs of integration of information:

- Information for various inter-related parameters provides clear picture
- Comprehensive review of business situation is possible
- Disjoint information may have serious gaps
- Redundancy of information is avoided by scientific linking
- Cross functional impacts in the business is assessed



(ii) 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 re-quirements 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.

(iii) Workers behind the Scene

In addition to those who design, use, and administer a database, others are associated with the design, development, and operation of the DBMS software and system

environment. These persons are typically not interested in the database itself. We call them the "workers behind the scene," and they include the following categories.

- DBMS system designers and implementers are persons who design and implement the DBMS modules and interfaces as a software package. A DBMS is a complex software system that consists of many components or modules, including modules for implementing the catalogue, query language, interface processors, data access, concurrency control, recovery, and security. The DBMS must interface with other system software, such as the operating system and compilers for various programming languages.
- Tool developers include persons who design and implement tools—the software packages that facilitate database system design and use, and help improve performance. Tools are optional packages that are often purchased separately. They include packages for database design, performance monitoring, natural language or graphical interfaces, prototyping, simulation, and test data generation. In many cases, independent software vendors develop and market these tools.
- Operators and maintenance personnel are the system administration personnel who are responsible for the actual running and maintenance of the hardware and software environment for the database system.

Although the above categories of workers behind the scene are instrumental in making the database system available to end users, they typically do not use the database for their own purposes.

3. (c) (i) Describe the powers of Central Government to make rules by notifying in the Official Gazette and Electronic Gazette under Information Technology Act,2000. [8]

(ii) List the tangible and intangible benefits of ERP. [8]

Answer:

(i) Powers of Central Government to make rules: Section 87 of the Information Technology Act, 2000 confers on the Central Government the power to make rules by notifying in the Official Gazette and the Electronic Gazette, in respect of certain matters, some of which are:

- Manner in which
  - any information or matter may be authenticated by means of digital signature under section 5;
  - electronic records shall be filed, created or issued and the method of payment;
  - digital signature may be affixed under section 10;
  - the adjudicating officer shall hold enquiry under section 46.
- (Electronic) Form in which
  - electronic records shall be filed, created or issued;
  - digital signature may be affixed under section 10;
  - an application for licence may be made;
  - application is made for renewal of licence under section 23;

- application for issue of a digital signature certificate may be made;
- appeal may be filed .

➢ Prescribing fee

- payable along with application for license;
- for renewal of a license under section 23;
- (late) payable under proviso to section 23;
- to be paid to certifying authority for issue of digital signature certificate;
- for filing an appeal.

➢ Prescribing salary, allowances and other conditions of service of the

- Presiding Officer under section 52;
- Officers and employees.

➢ Prescribing procedure

- for security, for the purpose of creating secure electronic record and secure digital signature under section 16;
- For investigation of misbehavior or incapacity of the Presiding Officer .

➢ Prescribing

- standards to be observed by the Controller ;
- requirements which an applicant must fulfill ;
- period of validity of license granted ;
- documents which shall accompany an application for license;
- qualification and experience which the adjudicating officer shall possess;
- any other power of the civil court;

➢ Matters relating to the

- type of digital signature under section 10;
- Any other.

(ii) Tangible and Intangibles benefits of ERP

Some of the quantifiable and tangible benefits of ERP system are mentioned below: Implementation of ERP, however, does not lead to headcount reduction (redundancies of few lower ended positions of payroll and accounts payable gets counterbalanced by additional higher paid IT staff).

1. Reduced level of inventory, including raw material, work in progress and finished goods, through improved planning and control.
2. Reduced materials cost through improved procurement and accounts payable practices, less obsolescence and wastage.
3. Reduced labour cost through better allocation and reduction of overtime of workmen directly involved with production such as technicians and skilled workers.

4. Improved production throughput through better scheduling of critical equipment and sub contracting operations, thereby minimizing shortages, interruption and rework.
5. Reduction in the cost of after sales services.

In addition to tangible benefits, following intangible benefits also occur:

1. Integration of information resulting efficiency, transparency and effective MIS.
2. Error reduction, accuracy of inventory record.
3. Improved customer service, on time shipment, shorter order to shipment cycle.
4. Establishment of standardized procedures.
5. Improved accounting control and shorter sales to cash cycle.
6. Legal and regulatory compliance.