Paper 9 - Operations Management and Information Systems
Section – A

Question No. 1 is compulsory and any 4 from the rest

1. (a) If the demand function is $X = \frac{20}{p+1}$, determine the price elasticity of demand if p=3.

(b) A job has been time standard for 20 observations. The mean actual time was 5.83 minutes and the standard deviation of the time is estimated to be 2.04 minutes. How many total observations should be taken for 95% confidence that the mean actual time has been determined within 10%?

(c) The demand for sewing machine was estimated as 1000 per month for 5 months. Later on the actual demand was found as 900, 1050, 1100 and 950, respectively. Calculate the Tracking Signal.

(d) An assembly line of an item A has the following output in a 10 week period:

Week No	1	2	3	4	5	6	7	8	9	10
Std. hrs produced	350	375	380	400	300	325	340	370	390	350

Calculate the demonstrated capacity of the assembly line per week.

(e) List the name of the Qualitative Approaches regarding the Forecasting Technique.

(f) Discuss the Input/ Output Control. **[6x2 =12]**

Answer of 1:

(a) Here, $X = \frac{20}{P+1} \therefore \frac{dx}{dp} = -\frac{20}{(p+1)^2}$

Now, price elasticity of demand, say,

$$e_P = \frac{P}{x}.\frac{dx}{dp} = \frac{p}{20} \times (p+1) \times -\frac{20}{(p+1)^2}$$

If p = 3

$$e_P = \frac{3}{20} \times (3+1) \times -\frac{20}{(3+1)^2} = \frac{3}{20} \times (4) \times -\frac{20}{(4)^2} = \frac{3}{20} \times 4 \times -\frac{20}{4 \times 4} = -\frac{3}{4}$$

$$\left|e_p\right| = \frac{3}{4}$$

Comment: As $\left|e_p\right| = \frac{3}{4} < 1$, demand is inelastic at p=3.

(b) $n = \left(\frac{Z s}{A \bar{x}}\right)^2 = \left(\frac{1.96\,(2.04)}{0.10\,(5.83)}\right)^2 = 47$

Therefore, a total of 47 observations should be made. Since 20 observations have already been made, only 27 more are necessary.

(c) $$MAD = \frac{|1000-900| + |1000-1050| + |1000-1000| + |1000-1100| + |1000-950|}{5}$$

$$= \frac{100+50+0+100+50}{5}$$

$$= 60 \text{ units of sewingmachines}$$

$$\text{Bias} = \frac{(1000-900)+(1000-1050)+(1000-1000)+(1000-1100)+(1000-950)}{5}$$

$$= \frac{100-50+0-100+50}{5}$$

$$= 0 \text{ units of sewingmachines}$$

(d) Statement showing the Demonstrated Capacity

Week No	Standard Hours Produced
1	350
2	375
3	380
4	400
5	300
6	325
7	340
8	370
9	390
10	350
Total	**3,580**

Demonstrated capacity is the average of the total standard hours produced over a number of periods.
Total Number of weeks = 10
Total Standard Hours Produced = 3,580 standard hours
Average per week= 3,580 /10 = 358 standard hours.

(e) Qualitative approaches include five forecasting techniques:

- Grass – Root Forecasting
- Focused Forecasting
- Historical Analogy
- Panel Consensus
- Delphi Method

(f) Input /Output Control

It is a control technique where the planned and actual inputs are monitored. Actual input is compared to planned inputs to identify where work center output might vary from the plan because work is not available at the work center. Actual output is also compared to the planned output to identify problems within the work center. Planned and actual inputs as well as outputs have an impact on the Work-in-Process (WIP) inventory.

2.(a)Discuss the objectives of Maintenance Management.

(b)The Simple Engineering Company has a machine whose purchase price is ₹80,000. The expected maintenance costs and resale price in different years are as given here:

Year	1	2	3	4	5	6	7
Maintenance Cost (₹)	1,000	1,200	1,600	2,400	3,000	3,900	5,000
Resale Value ('000							

₹)	75	72	70	65	58	50	45

After what time interval in your opinion, should the machine be replaced?

(c) State the Cycle Time in the Line Balancing. **[5+5+2]**

Answer of 2:

(a) Objectives of Maintenance Management

The following are some of the objectives of Maintenance Management:

(i) Minimizing the loss of productive time because of equipment failure (i.e., minimizing idle time of equipment due to break down).
(ii) Minimizing the repair time and repair cost.
(iii) Minimizing the loss due to production stoppages.
(iv) Efficient use of maintenance personnel and equipments.
(v) Prolonging the life of capital assets by minimizing the rate of wear and tear.
(vi) To keep all productive assets in good working condition.
(vii) To maximize efficiency and economy in production through optimum use of facilities.
(viii) To minimize accidents through regular inspection and repair of safety devices.
(ix) To minimize the total maintenance cost which includes the cost of repair, cost of preventive maintenance and inventory carrying costs due to spare parts inventory.
(x) To improve the quality of products and to improve productivity

(b) The optimal replacement period determination is shown in table below:

Table: Determination of Optimal replacement period

	Maintenance	Cum, Main.			
Year	Cost, M_t	Cost, ΣM_t	C – S	T (n)	A (n)
(i)	(ii)	(iii)	(iv)	(v) = (iii) +(iv)	(vi) = (v) /n
1	1000	1000	5000	6000	6000
2	1200	2200	8000	10200	5100
3	1600	3800	10000	13800	4600*
4	2400	6200	15000	21200	5300
5	3000	9200	22000	31200	6240
6	3900	13100	30000	43100	7183
7	5000	18100	35000	53100	7586

Here minimum A(n) = ₹4600, for n = 3(shown by *mark). The machine should, therefore, be replaced every three years.

(c) Line balancing is arranging a production line so that there is an even flow of production from one work station to the next, i.e. so that there are no delays at any work station that will leave the next work station with idle time.

The key to efficient line balancing is to group activities or tasks in such a way that the work times at the work station are at or slightly less than the cycle time or a multiple of cycle time if more than one worker is required in any workstation.

Determination of cycle time (CT) : When the amount of output units required per period (period may be hour, shift, day or week etc.) is specified and the available time per period is given (i.e., the number of working hours per shift, number of shifts per day, number of working days per week etc.) then,

$$\text{Cycle time (CT)} = \frac{\text{Available time per Period}}{\text{Out units required per period}}$$

Cycle time is the time interval at which completed products leave the production line.

3. (a) Request for maintenance service made upon a centralized maintenance facility have been simulated for a typical 8 hour shift with arrival and service pattern as shown below:

Request arrival (Clock) time	Repair service Time
1:30	60 mins
2:00	20 mins
4:15	45 mins
4:30	120 mins
5:30	30 mins
7:30	10 mins

The labour charges of maintenance crew is ₹ 40 per hour whether working or idle. The waiting time or operators and machinery that has broken – down is costed at ₹ 70 per hour.

(i) Find the idle cost of the maintenance facility.
(ii) Find the waiting time cost of operators and machinery (not including repair time).
(iii) Find the total facility idle time and machinery waiting time cost.
(iv) Assuming that for an additional cost of ₹ 10 per hour the maintenance centre could add another crew and decrease the repair time by one third, would the additional cost be justified?

(b) A fleet owner finds from his past records that the costs per year of running a vehicle whose purchase price is ₹ 50,000 are as under:

Year	1	2	3	4	5	6	7
Running Cost (₹)	5,000	6,000	7,000	9,000	11,500	16,000	18,000
Resale Value (₹)	30,000	15,000	7,500	3,750	2,000	2,000	2,000

Thereafter, running cost increases by ₹ 2,000, but resale value remains constant at ₹ 2,000. At what age is a replacement due? [8+4]

Answer of 3:

(a) Calculation of machine down time:

Request Arrival time	Repair time reqd. with one crew (mins)	Repair time begins (clock time)	Repair time ends (clock time)	M/c down time with one = crew Idle time + Repair time = Total time
01:30	60	01:30	02:30	Nil + 1.0 = 1.00
02:00	20	02:30	02:50	0.5 + 0.33 = 0.83
04:15	45	04:15	05:00	Nil + 0.75 = 0.75
04:30	120	05:00	07:00	0.5 + 2.0= 2.50
05:30	30	07:00	07:30	1.5 + 0.5 = 2.00
07:00	10	07:30	07:40	0.5 + 0.166 = 0.666
				Total (Hrs.) = 3.00 + 4.746 = 7.746 = 7.75 Hrs.

(i) Calculation of the idle time cost of maintenance facility:
Total repair service time = (60 +20 + 45 + 120 + 30 + 10)mts. = 285 mts. = 4.75hrs.
Total idle time of maintenance facility = 8.00 – 4.75 = 3.25hrs.
Total idle time cost of maintenance facility = 3.25 x 40 = ₹130

(ii) Calculation of waiting time of operators:
Total waiting time for repair = 3.0 hrs
Waiting time for cost = 3.0 x 70 = ₹210

(iii) Calculation of total facility idle time and machinery waiting time cost:
Total idle time cost of maintenance facility + machinery waiting time cost = 130 + 210 = ₹340

(iv) Adding one more maintenance crew at a cost of ₹10 per hour decreases repair time by one third.
Increase in labour cost/shift of 8 hours = ₹10 x 8 = ₹80
Decrease in repair time = 1/3 of repair time with one crew
Saving in operator and machine time = $\frac{1}{3}$x4.75 = 1.582 hrs.
Idle time cost = 1.582 x 70 = ₹110.74
Since saving in operator and machinery idle time cost is (i.e., ₹110.74) more than the increase in repair cost (i.e., ₹80/-), it is justified to have one more maintenance crew.

(b) Statement Showing the Replacement Period:

Year (1)	Net Capital (₹) (2)	Annual Maintenance Cost (₹) (3)	Cummulative Operations Costs (₹) (4)	Total Cost (₹) (5= 3+4)	Average Annual Cost (₹) (5) /(1)
1	20,000	5,000	5,000	25,000	25,000
2	35,000	6,000	11,000	46,000	23,000
3	42,500	7,000	18,000	60,500	20,167
4	46,250	9,000	27,000	73,250	18,313
5	48,000	11,500	38,500	86,500	17,300
6	48,000	16,000	54,500	1,02,500	17,083*
7	48,000	18,000	72,500	1,20,500	17,214

Optimal replacement at the end of 6th year.

4.(a) A firm owns facilities at six places. It has manufacturing plants at places A, B and C with daily production of 50, 40, and 60 units respectively. At point D, E, and F it has three warehouses with daily demands of 20, 95, and 35 units respectively. Per unit shipping costs are given in the following table. If the firm wants to minimize its total transportation cost, how should it route its products by using its LCM?

		Warehouse		
		D	E	F
Plant	A	6	4	1
	B	3	8	7
	C	4	4	2

(b) Given is the following information regarding a project:

Activity	A	B	C	D	E	F	G	H	I	J	K	L
Dependence	-	-	-	AB	B	B	FC	B	EH	EH	CDFJ	K
Duration	3	4	2	5	1	3	6	4	4	2	1	5

Draw the Network Diagram and identify the Critical Path and Project Duration. [6+6]

Answer of 4:

(a)

To → / From ↓	D	E	F	Supply
A	6	4 [15]	1 [35]	~~50~~ 15
B	3 [20]	8 [20]	7	~~40~~ 20
C	4	4 [60]	2	~~60~~
Demand	20	95	35	150

Step 1: Here the lowest cost is 1 which appears in cell (A,F). We assign the demand 35 units and leave the supply 15 units. Consequently, we crossed the last column.

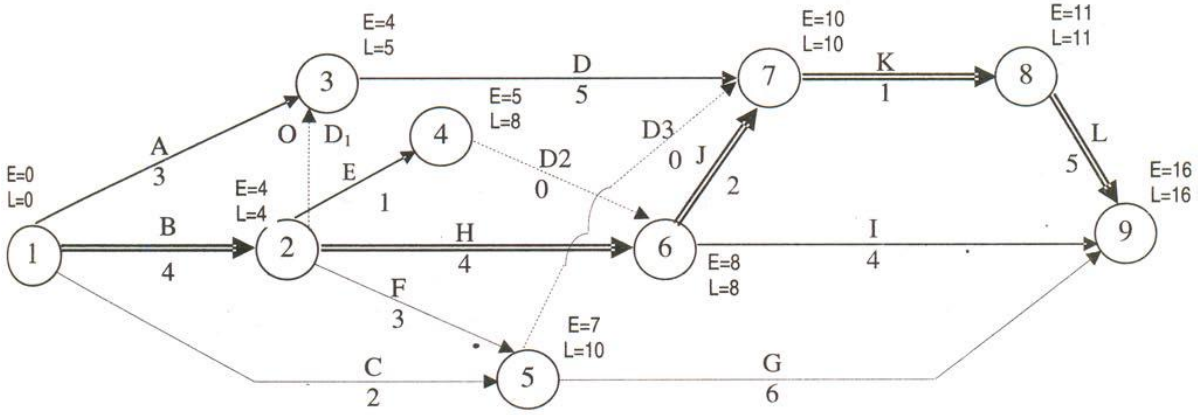
Step 2: After that the lowest cost is 3 which appears in cell (B,D). We assign the demand 20 units and leave the supply 20 units. We crossed the First column.

Step 3: The smallest element of the remaining matrix is 4 which appears in cell (C, E). We assign the 60 units demand and exhaust the all supply and crossed the last row.

Step 4: The remaining the 20 units are assign in cell (B,E).

The total cost associated with the solution is:
3x20+4x15+8x20+4x60+1x35=(60+60+160+240+35) = 870

(b) Network Diagram:



Network Table:

Activity	Duration	EST	LST	EFT	LFT	Total Float	Free Float	Independent Float
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
A	3	0	2	3	5	2	2 – 1= 1	1 – 0 = 1
B	4	0	0	4	4	[0]	0	0
C	2	0	8	2	10	8	8 – 3 = 5	5 – 0= 5

D1	0	4	5	4	5	1	1 – 1 = 0	0
D	5	4	5	9	10	1	1 – 0 = 1	1 – 1 = 0
E	1	4	7	5	8	3	3 – 3 = 0	0
F	3	4	7	7	10	3	3 – 3 = 0	0
G	6	7	10	13	16	3	3 – 0 = 3	3 – 3 = 0
D2	0	5	8	5	8	3	3 – 0 = 3	3 – 3 = 0
H	4	4	4	8	8	**0**	0	0
I	4	8	12	12	16	4	4 – 0= 4	4 – 0= 4
J	2	8	8	10	10	**0**	0	0
D3	0	7	10	7	10	3	3 – 0 = 3	3 – 3 = 0
K	1	10	10	11	11	**0**	0	0
L	5	11	16	16	16	**0**	0	0

Answer: **Critical path is B – H – J – K – L. Expected Duration = 16days**

The columns are updated in the following order as under:

(1) Activity (including Dummies) are listed from the Question and network Diagram
(2) Duration (including Dummies) are listed from the Question and Network Diagram
(3) EST = E value of LHS/ Tail Event from Diagram.
(6) LFT = L value of RHS/ Head Event from Diagram.
(5) EFT = EST + Duration as per Column (2). Hence Column (5) = Column (3) + Column (2)
(4) LST = LFT - Duration as per Column (2). Hence column (4) = Column (6) – Column (2)
(7) Total Float = [LET – EFT] or [LST – EST] = [Col.(6) – Col.(5)] or [Col.(4) – Col.(3)]
(8) Free Float = Total Float – Head Event Slack i.e. [Col.(7) – difference between L and E of RHS Event].

Note: If Total Float is Zero, Free Float is also equal to Zero If a negative value is derived, it is restricted to zero.

(9) Independent Float = Free Float – Tail Event Slack i.e. [Col (8) – Difference between L and E of LHS Event].

Note: If Free Float is Zero, Independent Float is also equal to Zero. If a negative value is derived, it is restricted to zero.

Note:

- The activities whose Total Float is Zero are Critical Activities. These Total Floats are circled and the respective activities are indicated by double in the network diagram.
- Dummy Activities may or may not lie on the critical path. However, in this question, the dummy activities do not fall on the Critical Path.

5. (a) A farmer has a farm with 125 acres. He produces Carrot, Beetroot and Potato. Whatever he produces is fully sold in the market. He gets ₹ 5 per kg for carrot, ₹ 4 per kg for Beetroot and ₹ 5 per kg for potato. The average yield is 1500 kg for Carrot per acre, 1800 kg of Beetroot per acre and 1200 kg of Potato per acre. To produce each 100 kg of Carrot and Beetroot and 80 kg of Potato, a sum of ₹ 12.50 has to be spent for manure. Labour required for each acre to raise the crop is 6 men – days for carrot and Potato each and 5 man- days for Beetroot. A total of 500 man days of labour at the rate of ₹40 per man – day are available. Formulate a LPP to maximize the farmer's total profit.

(b) Discuss the advantages of Network Scheduling. [9+3]

Answer of 5:

(a) : Let x_1, x_2 and x_3 be the number of acres allotted for cultivating carrot, beetroot and potato respectively. The profit from the produces is determined in the following manner –

Particulars per acre	Carrot	Beetroot	Potato
Selling Price	₹5 per Kg x 1500kgs = ₹7500	₹4 per kg x 1800kgs = ₹7200	₹5 per kg x 1200 kgs = ₹6000
Less: manure Cost	1500kgs x ₹12.50/100 = ₹187.50	1800 kgs x ₹12.50/100 = ₹225.00	1200 kgs x ₹12.50/80 = ₹187.50
Less: Labour Cost	₹40 x 6 = ₹240	₹40 x 5 = ₹200	₹40 x 6 = ₹240
Profit per acre	**₹7072.50**	**₹6775**	**₹5572.50**

Maximize Profit $Z = 7072.50\ x_1 + 6775\ x_2 + 5572.5\ x_3$

Subject to $x_1 + x_2 + x_3 \leq 125$ **(Land Availability)**

$6x_1 + 5x_2 + 6x_3 \leq 500$ **(Man Days availability)**

$x_1, x_2, x_3 \geq 0$ **(Non- Negativity Assumption)**

(b) Advantages of Network Scheduling

Network based scheduling techniques can be beneficial in many ways if they are properly used. Like all other scheduling techniques, however, they are not panaceas or substitutes for judgment of good management. Since scheduling is an attempt to plan future work, and estimate the time for the required work. No technique will make poor estimates any better. Scheduling can help plan the work, but the accuracy of plans and schedules depends on the accuracy of the time estimates used in their development. Knowledgeable people and/or reliable techniques should be used to provide the time estimates.

Assuming that the estimates for a network scheduling method are as good as those for other scheduling methods, the network techniques may offer some advantages:

(i) They lead to planning a project to the selected level of details so that all parts of the project and their intended order of accomplishment are known.
(ii) They provide a fairly accurate estimate of the length of time it will take to complete the project and activities that must be kept on time to meet the schedule.
(iii) They provide a graphical picture and standardized vocabulary to aid in understanding the work assignments and communicate it among the people involved in the project.
(iv) They provide means to track the progress on a project, i.e., show where work is with respect to the plan.
(v) They identify and focus attention on potentially troublesome activities to facilitate management by exception.
(vi) They provide a means of estimating the time and cost impact of changes in the project plan at any stage.

6. (a) Describe the objectives of Time Study.

(b) Following is the data obtained from the Bureau of Industrial Costs and Prices. Have the prices kept pace with the rising costs?

Note 2004 =100

	2004	05	06	07	08	09	10	11	12
Costs per unit of Output	**203**	**216**	**223**	**239**	**248**	**253**	**279**	**301**	**311**
Price per final output	**225**	**242**	**250**	**271**	**275**	**277**	**295**	**318**	**329**

[6+6]

Answer of 6:

(a) Time study is concerned with the determination of the amount of time required to perform a unit of work. It consists of the process of observing and recording the time

required to perform each element of an operation so as to determine the reasonable time in which the work should be completed. Time study is defined by ILO as below "Time study is a work measurement technique for recording the times and rates of working for the elements of a specified job carried out under specified conditions and for analysing the data so as to obtain the time necessary for carrying out the job at a defined level of performance".

Objective of time study:

The main objective is "to determine by direct observation, the quantity of human work in a specified task and hence to establish the standard time, within which an average worker working at a normal pace should complete the task using a specified method".

The other objectives are:

(i) To furnish a basis of comparison for determining operating effectiveness.
(ii) To set labour standard for satisfactory performance.
(iii) To compare alternative methods in method study in order to select the best method.
(iv) To determine standard costs.
(v) To determine equipment and labour requirements.
(vi) To determine basic times/normal times.
(vii) To determine the number of machines an operator can handle.
(viii) To balance the work of operators in production or assembly lines.
(ix) To provide a basis for setting piece rate or incentive wages.
(x) To set the completion schedules for individual operations or jobs.

(b) Let us call costs as X and prices as Y as shown in the following table:

X	Y	$x = X - \bar{X}$	$y = Y - \bar{Y}$	X^2	xy	y^2
203	225	-49.6	50.8	2460	2520	2581
216	242	-36.6	33.8	1340	1237	1142
223	250	-29.6	25.8	876	764	666
239	271	-13.6	4.8	185	65	23
248	275	-4.6	0.8	21	4	1
253	277	-00.4	1.2	0	0	1
279	298	26.4	19.2	697	507	369
301	318	48.4	42.2	2343	2042	1781
311	329	58.4	53.2	3411	3107	2830
$\sum x = 2273$	$\sum y = 2482$			$\sum x^2$ =11,333	$\sum xy$ =10,246	$\sum y^2$ =9393

$\therefore \bar{X} = 252.60 \quad \therefore \bar{Y} = 275.80$

For a linear regression, the coefficient of correlation between the variables X and Y is given by:

$$r = \frac{\sum xy}{\sqrt{\sum x^2 \sum y^2}}$$

Where, as already noted, $x = X - \bar{x}$ and $y = Y - \bar{y}$.

This is called product – moment formula.

Accordingly,

$$r = \frac{10,246}{\sqrt{(11,3333)(9393)}} = \frac{10246}{10318} = 0.99$$

Therefore, there is a close correlation between costs and prices.

Section – B

Question No. 7 is compulsory and any 4 from the rest

7. (a) Define - Digital Signature. **[4 x2 =8]**

Answer:
"**Digital Signature**"- Authentication of any electronic record by a subscriber by means of an electronic method or procedure.

(b) What is meta – data?

Answer:

Database system contains not only the database itself but also a complete definition or description of the database structure and constraints. This definition is stored in the system **catalog**, which contains various information. The information stored in the catalog is called **meta-data**, and it describes the structure of the primary database

(c) Mention the names of Software Packages which serve as an aid in programme analysis.

Answer:
Software Packages which serve as aids in program analysis are:

a. Automated flowcharting programs
b. Automated decision table programs
c. Scanning routines
d. Mapping programs
e. Program tracing

(d) What is Coding of Information?

Answer:
Coding categorizes information and can replace long, description strings with a few letters or numbers (or both).Information stored in a computer is often coded.

8. (a) Discuss what is On – Line Transaction Processing (OLTP). **[3+3+2]**

Answer:
Online Transaction Processing (OLTP) applications are client/server applications that give online users direct access to information. The OLTP applications process units of work, called transactions. In today's competitive environment, information at right time plays a great role in controlling costs of various resources and providing best possible services to the customers. In other words, business environment has been characterized by growing competition; shrinking cycle time and accelerating pace of technological innovations and companies have to focus on better information management. Better information means right information at right time. All of these are supported by OLTP.

OLTP are being adopted in wider scale to have the following advantages:

- It can serve multiple users at a point of time;
- Technology serves the facilities to collect information from multi-locations;
- High flexibility in information processing etc.

(b) What is the role of Database Designer?

Answer:

Database designers are responsible for

- identifying the data to be stored in the database
- for choosing appropriate structures to represent and store this data.

These tasks are mostly undertaken before the database is actually implemented and populated with data.

It is the responsibility of database designers to communicate with all prospective database users,

- in order to understand their requirements, and
- to come up with a design that meets these requirements.

In many cases, the designers may be assigned other staff responsibilities after the database design is completed.

Database designers

- typically interact with each potential group of users and
- develop a view of the database that meets the data and processing requirements of this group. These views are then analyzed and integrated with the views of other user groups.

The final database design must be capable of supporting the requirements of all user groups.

(c) Define "key pair" in the context of Asymmetric Crypto System.

Answer:

"**Key pair**", in an asymmetric crypto system, means a private key and its mathematically related public key, which are so related that the public key can verify a digital signature created by the private key.

9. (a) Write a note on Public Key Infrastructure (PKI) processes. [6+2]

Answer:

Public Key Infrastructure (PKI) is about the management and regulation of key pairs by allocating duties between contracting parties (Controller/ Certifying Authority (CA)/Subscribers), laying down the licensing and business norms for the CA and establishing business processes/ applications to construct contractual relationships in a digitized world.

The idea is to develop a sound public key infrastructure for an efficient allocation and verification of digital signatures certificates.

The total process of Public Key Infrastructure (PKI) involves the following steps:

Steps 1 - Subscriber applies to Certifying Authority (CA) for Digital Signature Certificate.

Step 2 - CA verifies identity of Subscriber and issues Digital Signature Certificate.

Step 3 -CA forwards Digital Signature Certificate to Repository maintained by the Controller.

Step 4 - Subscriber digitally signs electronic message with Private Key to ensure Sender Authenticity, Message Integrity and Non-Repudiation and sends to Relying Party.

Step 5 -Relying Party receives message, verifies Digital Signature with Subscriber's Public Key, and goes to Repository to check status and validity of Subscriber's Certificate.

Step 6 - Repository does the status check on Subscriber's Certificate and informs back to the Relying Party.

(b) Define - Management Information System.

Answer:

Management Information System (MIS): Decisions are made on many issues that recur regularly and require a certain amount of information. The information systems are be developed so that the reports are prepared regularly to support these recurring decisions. MIS is an information system that is designed to provide accurate, relevant and timely information to managers at different levels and in different functional areas throughout the organization for decision-making purpose

10. (a) List the benefits of Electronic Data Interchange. **[4+4]**

Answer:

Electronic Data Interchange (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 recipient and is electronically transferred to sender. Therefore this acknowledgement which is sent electronically by the recipient to sender, states that the message has been received.

(b) Write a note on Data Dictionary.

Answer:

Data Dictionary: Each computer record of a data dictionary contains information about a single data item used in a business information system. The information in each record of a Data Dictionary may include the following:

(i) Codes describing the data item's length, data type and range.

(ii) Identity of the source documents used to create the data.

(iii) Names of the computer files storing the data item.

(iv) Identity of individuals/programs permitted to access the data item.

(v) Identity of programs/individuals not permitted to access the data item.

(vi) Names of the computer programs that modify the data item.

For an Auditor, A data dictionary can also help to establish an audit trial because it can identify the input sources of data items, the computer programs that modify particular data items, and the managerial reports on which data items are output.

For the accountants, a data dictionary can also be used to plan the flow of transaction data through the system.

11. (a) Describe the types of system. [6+2]

Answer:

i. According to Elements:

Abstract System: Abstract System are Conceptual System which are just an orderly arrangement of interdependent ideas. Ideas here mean just the idea which does not contain any physical place.

Physical System: A physical system is a collection of tangible elements.

Physical System	Particulars
Circulatory System	The heart and blood vessels which move blood through the body.
Transportation System	The personnel, machines, and organizations which transport goods.
Weapons System	The equipment, procedures, and personnel which make it possible to use a weapon.
School System	The buildings, teachers, administrators, and textbooks that function together to provide education to students.
Computer System	The equipment which function, together to accomplish Computer processing.

B. According to Interactive Behaviour:

I. Open System
II. Closed System

Open 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.

Closed Systems: 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.

C. According to Degree of Human Intervention

Manual Systems: Manual Systems are the systems where data collection, manipulation, maintenance and final reporting are carried out absolutely by human efforts.

Automated Systems: Automated Systems are the systems where computers or microprocessors are used to carry out all the tasks of data collection, manipulation, maintenance and final reporting.

D. According to Working/Output:

Deterministic System: A deterministic system operates in a predictable manner wherein the interaction among the parts is known with certainty. An example is a correct computer program, which performs exactly according to a set of instructions.

Probabilistic System: The probabilistic system can be described in terms of probable behavior, but, a certain degree of error is always attached to the prediction. Where a set of instructions given to a human who, for a variety of reasons, may not follow the instructions exactly as given. Forecasting is also a Probabilistic System.

(b) List the role of Information Systems in Management.

Answer:

An Information System can provide effective information for decision-making and control of some functionalities of an organization. Enterprises use information system to reduce costs, control wastes or generate revenue. Some of important implications of information system in business are as follows:

- Information system helps managers in effective decision-making to achieve the organizational goal.
- Innovative ideas for solving critical problems may come out from good Information System.
- Knowledge gathered through Information System may be utilized by managers in unusual situations.
- It helps in taking right decision at right time.
- Based on the well designed information system, an organization will gain edge in the competitive environment.

12. (a) Discuss the major factors to be considered in designing user input and user output in relation to a system. [6+2]

Answer:

Major factors that should be considered while designing systems input are briefly discussed below:

Input design consists of developing specifications and procedures for data preparation, developing steps which are necessary to put transactions data into a usable form for processing, and data-entry. Important factors to be considered in the input design:

(i) Content: The system designer has to prepare new documents for collecting the information which are needed to generate user output.

(ii) Timeliness: In data processing, it is very important that data is inputted to computer in time because outputs cannot be produced until certain inputs are available.

(iii) Media: Media is just a device by which data is entered in the system and includes magnetic tapes, magnetic disks, key-boards, optical character recognition and voice input etc.

(iv) Format: After the data contents and media requirements are determined, input formats are to be considered. The type and length of each data field as well as any other special characteristics must be defined.

(v) Input volume: Input volume refers to the amount of data that has to be entered in the computer system at any one time. In many real-time transaction processing systems, input volume is light. In batch-oriented transaction processing systems, input volume could be heavy which involve thousands of records and also more than it.

These are the important factors which should be considered by the system analyst while designing user outputs are:

(i) Content: Only the required information should be included in various outputs because too much content can cause managers to waste time in selecting the information that they need.
(ii) Form: Content can be presented in various forms-quantitative, non-quantitative, text, graphics, video and audio many managers prefer summary information in chart form such as pie chart, line chart, bar chart.
(iii) Output volume: It is better to use high-speed printer which are fast in case the volume is heavy.
(iv) Timeliness: Some outputs are required on a regular, periodic basis - perhaps daily, weekly, monthly, at the end of a quarter or annually.
(v) Media: varieties of output media are available in the market are - video display, microfilm, magnetic tape/disk and voice output.
(vi) Format: The manner in which data are physically arranged is referred to as format.

(b) What is programming language?
Answer:

A **programming language** is a computer language that the programmers use to develop applications, scripts, or other set of instructions for a computer to execute.

Programming languages are coded in the form of statements. The programming Languages commonly used are as follows:

(i) High - level general purpose programming language such as COBOL and C language.
(ii) Object oriented languages such as C++, JAVA etc.
(iii) Scripting language like JAVA Script, VBScript.
(iv) Decision Support or Expert System languages like PROLOG.