## Paper – 9 - Operations Management and Information Systems

**Full Marks-100** **Time Allowed 3 Hours**

## Section - A

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

**1. Answer any 6**

**(a) The demand function of a monopolist is P=$\frac{3}{q}$ and the cost function of is C = 2q + 3q$^2$. Will the monopolist produce the commodity if his objective is to maximize profit?**

**(b) Describe about capital spare parts.**

**(c) Limitations of Preventive Maintenance.**

**(d) A firm operates 6 days a week on single shift of 8 hours per day basis. There are 10 machines of the same capacity in the firm. If the machines are utilized for 75 percent of the time at a system efficiency of 80 percent, what is the rated output in terms of standard hours per week?**

**(e) What are the success factors of QFD?**

**(f) Mention the characteristics of Just –in- Time systems.**

**(g) An analyst wants to obtain a cycle time estimate that is within ± 5% of the true value. A preliminary run of 20 cycles took 40 minutes to complete and had a calculated standard deviation of 0.3 minutes. What is the coefficient of variation to be used for computing the sample size for the forthcoming time study?**

**(h) Standard time for a task is 8 hours. Calculate the efficiency of a workman in the following cases:**
**(i) Worker completes the job in 10 hours.**
**(ii) Worker completes the job in 6 hours.** **[6x2=12]**

**Answer of 1:**

**(a)** $\pi$ = R - C = pq - C = $\frac{3}{q}$ .q – C

Where $\pi$ = Total Profit, R = Revenue and C= Cost

$\therefore \pi = 3 - 2q + 3q^3$

To maximize$\pi$, the first order condition is $\frac{d\pi}{dq} = 0$

or, - 2 - 6q = 0, or, 6q = - 2 or, q = $-\frac{1}{3} < 0$.

But the level of output cannot be negative. So, the monopolist will not produce the commodity.

**(b) Capital Spares**

Regular spares and Insurance spares are two ends of the spectrum; Capital spares fall somewhere in between. These spares are expensive and therefore it would be desirable to keep only as many as would be required from the viewpoint of service level. This decision is guided by the probability that a certain number of them are required over the life of the equipment.

If 'Pi' is the probability that 'i' spares would be required over the life of the equipment/s; C is the cost of a spare; Cs is the cost of shortage per unit and S is the salvage value of the spare part; then, the optimal number of the capital spares to be stocked, N* shall be such that:'

$$\sum_{i=0}^{N^*-1} P_i \le \frac{C_3 - C}{C_3 - S} \le \sum_{i=0}^{N^*} P_i$$

**(c) Limitations of Preventive Maintenance:**

(i) More expensive in the short term and during the initial stages of introduction of preventive maintenance programme.

(ii) Inspection of plant, equipment and machinery will have to be carefully planned and implemented and improved over a period of time.

**(d) Maximum number of hours of work possible per week:**

Number of machines x Machine hours worked per week

= 10 x 6 x 8 = 480 hours

If the utilization is 75% then number of hours worked = 480 x 75% = 360 hours i.e. utilized hours.

Rated output = Utilized hours x system efficiency = 360 x 80% = 288 standard hours.

**(e) Success Factors of Quality Function Development(QFD):**

(i) Accurate Customer Voice.

(ii) Strong Management Commitment.

(iii) A good consultant.

(iv) Regular projects reviews.

(v) Milestone celebration to keep interest high and to develop a sense of closure.

(vi) Sharing with other teams to facilitate deeper learning.

**(f) Characteristics of Just-In-Time System**

JIT systems focus on reducing inefficiency and unproductive time in the production process to improve continuously the process and quality of the product or service. Employee involvement and inventory reductions are essential to JIT operations. The salient characteristics of JIT are:

(i) Pull method of material flow

(ii) Constantly high quality

(iii) Small lot sizes

(iv) Uniform workstation loads

(v) Standardized components and work methods

(vi) Close supplier ties

(vii) Flexible workforce

(viii) Line flow strategy

(ix) Automated production and

(x) Preventive maintenance.

**(g)** Standard Deviation of sample (s) = 0.3 min /cycle

Mean of sample = $\bar{X} = \frac{40\,\text{min}}{20\,\text{cycle}} = 2$ min/ cycle

Coefficient of variation (v) = $\frac{S}{\bar{X}} = \frac{0.3}{2} = 0.15$

**(h)** Standard hours = 8 hours

(a) worker completes have work in 10 hours

$$\text{Efficiency} = \frac{\text{Standard hours}}{\text{Actual hours}} = \frac{8\,\text{hours}}{10\,\text{hours}} \times 100 = 80\%$$

(b) Worker completes the work in 6 hours

$$\text{Efficiency} = \frac{\text{Standard hours}}{\text{Actual hours}} = \frac{8\text{ hours}}{6\text{ hours}} \times 100 = 133.3\%$$

**2. (a) The automobile company manufactures around 150 scooters. The daily production varies from 146 to 154 depending upon the availability of raw material and other working conditions:**

| Production Per Day | Probability |
|---|---|
| **146** | **0.04** |
| **147** | **0.09** |
| **148** | **0.12** |
| **149** | **0.14** |
| **150** | **0.11** |
| **151** | **0.10** |
| **152** | **0.20** |
| **153** | **0.12** |
| **154** | **0.08** |

**The finished scooters are transported in a specially arranged lorry accommodating 150 scooters. Using following random numbers:**
**80, 81, 76, 75, 64, 43, 18, 26,10, 12, 65, 68, 69, 61, 57. Simulate the process to find out:**

**(i) What will be the average number of scooters waiting in the factory?**
**(ii) What will be the average number of empty space on the lorry?**

**(b) Describe the Importance of Product Design. [10+2]**

**Answer of 2:**

**(a) Based on production per day and probability, random numbers are assigned below:**

| Production per day | Probability | Cumulative Probability | Random number assigned |
|---|---|---|---|
| 146 | 0.04 | 0.04 | 00-03 |
| 147 | 0.09 | 0.13 | 04-12 |
| 148 | 0.12 | 0.25 | 13-24 |
| 149 | 0.14 | 0.39 | 25-38 |
| 150 | 0.11 | 0.50 | 39-49 |
| 151 | 0.10 | 0.60 | 50-59 |
| 152 | 0.20 | 0.80 | 60-79 |
| 153 | 0.12 | 0.92 | 80-91 |
| 154 | 0.08 | 1.00 | 92-99 |

**Based on 15 random numbers, production per day can be simulated as follows:**

| Sl. No. | Random numbers | Production per day | No of scooters waiting | No. of empty spaces in the lorry |
|---|---|---|---|---|
| 1 | 80 | 153 | 3 | |
| 2 | 81 | 153 | 3 | |
| 3 | 76 | 152 | 2 | |
| 4 | 75 | 152 | 2 | |
| 5 | 64 | 152 | 2 | |
| 6 | 43 | 150 | 0 | 0 |
| 7 | 18 | 148 | | 2 |
| 8 | 26 | 149 | | 1 |
| 9 | 10 | 147 | | 3 |
| 10 | 12 | 147 | | 3 |
| 11 | 65 | 152 | 2 | |

| | | | | |
|---|---|---|---|---|
| 12 | 68 | 152 | 2 | |
| 13 | 69 | 152 | 2 | |
| 14 | 61 | 152 | 2 | |
| 15 | 57 | 151 | 1 | |
| | | | 21 | 9 |

(i) Average number of scooters waiting = 21/15 = 1.4 per day
(ii) Average number of empty spaces = 9/15 = 0.6 per day

**(b) Importance of Product Design**

Production or operations strategy is directly influenced by product design for the following reasons:

(i) As products are designed, all the detailed characteristics of each product are established.
(ii) Each product characteristic directly affects how the product can be made or produced (i.e., process technology and process design) and
(iii) How the product is made determines the design of the production system (production design) which is the heart of production and operations strategy.

Further, product design directly affects product quality, production costs and customer satisfaction. Hence, the design of product is crucial to success in today's global competition.

A good product design can improve the marketability of a product by making it easier to operate or use, upgrading its quality, improving its appearance, and/or reducing manufacturing costs.

A distinctive design may be the only feature that significantly differentiates a product. An excellent design includes usability, aesthetics, reliability, functionality, innovation and appropriateness. An excellent design provides competitive advantage to the manufacturer, by ensuring appropriate quality, reasonable cost and the expected product features. Firms of tomorrow will definitely compete not on price and quality, but on product design.

**3(a) The manager of an oil refinery must decide on the optimum mix of two possible blending processes of which the inputs and outputs per production run is as follows:**

| Process | Input | | Output | |
|---|---|---|---|---|
| | Grade A | Grade B | Gasoline X | Gasoline Y |
| 1 | 6 | 4 | 6 | 9 |
| 2 | 5 | 6 | 5 | 5 |

**The maximum amounts available of crudes A and B are 250 units and 200 units respectively. Market demand shows that at least 150 units of gasoline X and 130 units of gasoline Y must be produced. The profits per production run from process 1 and Process 2 are ₹400 and ₹ 500 respectively. Formulate the problem for maximizing the profit.**

**(b) A radio manufacturer makes x sets of radio per week and total cost is $\left(\frac{x^2}{25}+3x+100\right)$.**

**The equation of the demand function is x = 75 - 3p (p = price). Show that if he wants to**

**maximize profit, he will produce about 30 sets of radio per week. What price per set will he charge?**

**(c) Describe the Baumol's Model of "sales maximization subject to a profit constraint" and "maximization of short –run profits subject to a minimum sales or market share constraint". [4+4+4]**

**Answer of 3 :**

**(a)** Decision variables. It is desired to determine the quantities of gasoline to be produced by the two blending processes. Let $x_1$, $x_2$ designate the number of production runs of two processes, respectively.

The feasible alternative are: $X_1 \geq 0$, $X_2 \geq 0$, the constraints of the problem are:

$6x_1 + 5x_2 \leq 250$
$4x_1 + 6x_2 \leq 200$ } **(Crude availability)**

$6x_1 + 5x_2 \geq 150$
$9x_1 + 5x_2 \geq 130$ } **(Market demand)**

The objective is to maximize the total profit:

$Z = 400x_1 + 500x_2$

The appropriate mathematical of the given problem as LP model is:

Maximize (Total Profit) $Z = 400x_1 + 500x_2$

Subject to the constraints

$6x_1 + 5x_2 \leq 250$
$4x_1 + 6x_2 \leq 200$
$6x_1 + 5x_2 \geq 150$
$9x_1 + 5x_2 \geq 130$
$x_1 x_2 \geq 0$

**(b)** Profit will be maximum when (i) MR = MC and (ii) Slope of MC > Slope of MR.
Suppose Total Costs C and Total Revenue is R.

So, $C = \left(\frac{x^2}{25} + 3x + 100\right)$ and $R = px$

The demand function is $x = 75 - 3p$

Or, $3p = 75 - x$

Or, $p = \frac{75 - x}{3}$

We know $R = px$

$$= \left(\frac{75 - x}{3}\right).x = 25x - \frac{x^2}{3}$$

Now, $MC = \frac{dC}{dx} = \frac{2x}{25} + 3$ and $MR = \frac{dR}{dx} = 25 - \frac{2x}{3}$

The first condition to maximize profit is MR = MC or, $25 - \frac{2x}{3} = \frac{2x}{25} + 3$

or, $\frac{2}{25}x + \frac{2}{3}x + = 25 - 3$

or, $\frac{56}{75}x = 22$

$\therefore x = \frac{22-75}{56} = 29.5$ or 30 (approx.)

The second condition to maximize profit requires, slope of MC > slope of MR.

Now, slope of MC = $\frac{d(MC)}{dx} = \frac{2}{25}$

And slope of MR = $\frac{d(MR)}{dx} = -\frac{2}{3}$. As $\frac{2}{25} > -\frac{2}{3}$, the second order condition is also fulfilled.

So, to maximize profit, the firm will produce 30 radio sets per week.

Price (p) = $\frac{75-x}{3} = \frac{75-30}{3} = 15$

So, price per set = ₹ 15.

**(c) Baumol's Model** of "sales maximization subject to a profit constraint" and its opposite "maximization of short-run profits subject to a minimum sales or market share constraint" is summarized as below:

| | |
|---|---|
| Total Revenue | $(R)=f_1(X,a)$ |
| Where | X = output |
| | a = advertisement. |
| Total Production Cost | $(C)= f_2 (X)$ |
| | $\prod$ = Minimum Acceptable Profit |
| | A (a) = total cost of the advertising function |

A firm aims at the maximization of

$R = f_1 (X, a)$

Subject to the minimum profit constraint

$$\prod = R - C - A \geq \prod$$

Its variant with Yarrow's constraints suggests sales maximization subject to a maximum market valuation due to wealth maximizing shareholders.

**4 (a) A departmental store has a single cahier. During the rush hours, customer arrives at a rate of 20 customers per hour. The average number of customers that can be processed by the cashier is 24 per hour. Assume that the conditions for use of the single – channel queuing model apply.**

**Required:**

**(i) What is the probability that the cashier is idle?**

**(ii) What is the average number of customers in the queuing systems?**

**(iii) What is the average time a customer spends in the system?**

**(iv) What is the average number of customers in the queue?**

**(v) What is the average time a customer spends in the queue waiting for service?**

**(b) Discuss the objectives of the Material Requirement Planning. [(2x5)+2]**

**Answer of 4:**

**(a)**

Here, Arrival Rate ($\lambda$) = 20 customers / hour

Service Rate ($\mu$) = 24 customers / hour

**(i)** Probability that the cashier is idle (or the probability of an empty system or idle system)

$$P_O = 1 - \frac{\lambda}{\mu} = 1 - \frac{20}{24} = \frac{1}{6} = 0.17$$

**(ii)** Average number of customers in the queuing system:

$$L_S = \frac{\lambda}{\mu - \lambda} = \frac{20}{24-20} = 5 \text{ customers}$$

**(iii)** Average time a customer spends in the system

$$W_S = \frac{1}{\mu - \lambda} = \frac{1}{24-20} = 0.25 \text{ hr. or } 15 \text{ minutes}$$

**(iv)** Average number of customers in the queue is:

$$L_q = \frac{\lambda}{\mu} x \left( \frac{\lambda}{\mu - \lambda} \right) = \frac{20}{24} x \left( \frac{20}{24-20} \right) = 4.17$$

**(v)** Average time a customer spends in the queue is:

$$W_q = \frac{\lambda}{\mu} x \left( \frac{1}{\mu - \lambda} \right) = \frac{20}{24} x \left( \frac{1}{24-20} \right)$$

$$= \frac{5}{24} \text{ or } 0.21 \text{ hour or } 12.5 \text{ minutes}$$

**(b)** MRP is a technique of working backward from the scheduled quantities and needs dates for end items specified in a master production schedule to determine the requirements for components needed to meet the master production schedule. The technique determines what components are needed, how many are needed, when they are needed and when they should be ordered so that they are likely to be available as needed.

**MRP Objectives:**

**(i) Inventory Reduction:** MRP determines how many components are required, when they are required in order to meet the master schedule. It helps to procure the materials/components as and when needed and thus avoid excessive build up of inventory.

**(ii) Reduction in the Manufacturing and Delivery Lead Times:** MRP identifies materials and component quantities, timings when they are needed, availabilities and procurements and actions required to meet delivery deadlines. MRP helps to avoid delays in production and priorities production activities by putting due dates on customer job orders.

**(iii) Realistic Delivery Commitments:** By using MRP, production can give marketing timely information about likely delivery times to prospective customers.

**(iv) Increased Efficiency:** MRP provides a close coordination among various work centers and hence helps to achieve uninterrupted flow of materials through the production line. This increases the efficiency of production system.

**5 (a) Five machines are available to do five different jobs. From past records, the time (in hrs.) that each machine takes to do each job is known and given in the following table:**

| Machines | Job | | | | |
|---|---|---|---|---|---|
| | I | II | III | IV | V |
| A | 2 | 9 | 2 | 7 | 1 |

| | | | | | |
|---|---|---|---|---|---|
| **B** | **6** | **8** | **7** | **6** | **1** |
| **C** | **4** | **6** | **5** | **3** | **1** |
| **D** | **4** | **2** | **7** | **3** | **1** |
| **E** | **5** | **3** | **9** | **5** | **1** |

**Find the assignment of machines to jobs that will minimize the total time taken.**

**(b) Describe about the Line Balancing. [10+2]**

**Answer of 5:**

**(a)**

**Steps 1. Subtracting the smallest element of each row from every element of the corresponding row, we get the adjoining reduced matrix**

**Table**

| Job / Machine | I | II | III | IV | V |
|---|---|---|---|---|---|
| A | 1 | 8 | 1 | 6 | 0 |
| B | 5 | 7 | 6 | 5 | 0 |
| C | 3 | 5 | 4 | 2 | 0 |
| D | 3 | 1 | 6 | 2 | 0 |
| E | 4 | 2 | 8 | 4 | 0 |

**Steps 2. Subtract the smallest element of each column from every element of the corresponding column to get the adjoining reduced matrix**

**Table**

| Job / Machine | I | II | III | IV | V |
|---|---|---|---|---|---|
| A | 0 | 7 | 0 | 4 | 0 |
| B | 4 | 6 | 5 | 3 | 0 |
| C | 2 | 4 | 3 | 0 | 0 |
| D | 2 | 0 | 5 | 0 | 0 |
| E | 3 | 1 | 7 | 2 | 0 |

**Steps 3. Row 2 has a single zero in column 5. Make an assignment by putting square ( ☐ ) around it, and delete the other zeros in column 5 my marketing 'x'.**

Now, column 4 has a single zero in row 3. We make an assignment by putting ( ☐ ) and cross the other zero which is not yet crossed. Column 2 has a single zero in row 4, we make an assignment.

**Table**

| Job / Machine | I | II | III | IV | V |
|---|---|---|---|---|---|
| A | [0] | 7 | ~~0~~ | 4 | ~~0~~ |
| B | 4 | 6 | 5 | 3 | [0] |
| C | 2 | 4 | 3 | [0] | ~~0~~ |
| D | 2 | [0] | 5 | ~~0~~ | ~~0~~ |
| E | 3 | 1 | 7 | 2 | ~~0~~ |

It may be noted that there are no remaining zeros, and row E and column III has no assignment. Thus, the optimal solution is not reached at this stage and we proceed to the following important steps:

**Steps 4. Draw the minimum number of horizontal and vertical lines necessary to cover all zeros at least once. The following systematic procedure may help to draw the minimum set of lines:**

(i) For simplicity, first make the Table, again.

**Table**

| Job / Machine | I | II | III | IV | V |
|---|---|---|---|---|---|
| A | 0 | 7 | ~~0~~ | 4 | ~~0~~ |
| B | 4 | 6 | 5 | 3 | 0 |
| C | ~~2~~ | ~~4~~ | ~~3~~ | 0 | ~~0~~ |
| D | ~~2~~ | 0 | ~~5~~ | ~~0~~ | ~~0~~ |
| E | 3 | 1 | 7 | 2 | ~~0~~ |

(ii) Secondly, mark (√) row 5 in which there is no assignment, i.e., the last row.
(iii) Then mark (√) column 5, which has a zero in the marked row.
(iv) Next mark (√) row 2, which has assignment in the marked column.
(v) Draw the minimum number of lines covering the unmarked rows and the marked columns.

**Steps 5. Examine the elements that do not have a line through them. Select the smallest of these and subtract it from all the elements that do not have a line through them. Add this element to every element lying at the intersection of two lines. Leave the remaining elements of the matrix unchanged.**

**Table**

| Job / Machine | I | II | III | IV | V |
|---|---|---|---|---|---|
| A | 0 | 7 | ~~0~~ | 4 | 1 |
| B | 3 | 5 | 4 | 2 | 0 |
| C | 2 | 4 | 3 | 0 | 1 |
| D | 2 | 0 | 5 | ~~0~~ | 1 |
| E | 2 | ~~0~~ | 6 | 1 | ~~0~~ |

**Steps 6. Repeat the steps to obtain optimal solution.**

**Table**

| Job / Machine | I | II | III | IV | V |
|---|---|---|---|---|---|
| A | ~~0~~ | 9 | 0 | 6 | 3 |
| B | 1 | 5 | 2 | 2 | 0 |
| C | 0 | 4 | 1 | ~~0~~ | 1 |
| D | ~~0~~ | ~~0~~ | 3 | 0 | 1 |
| E | ~~0~~ | 0 | 4 | 1 | ~~0~~ |

Thus in Table, there are no remaining zeros, and every row and column has assignment, i.e., optimal solution is reached.

| Machine | Job | Machine hours |
|---|---|---|
| A | III | 2 |
| B | V | 1 |
| C | I | 4 |
| D | IV | 3 |
| E | II | 3 |

Hence, the minimum time taken = 2 + 1 + 4 + 3 + 3 = 13 hours

**(b)** 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.
Line balancing is also defined as "the apportionment of sequential work activities into work stations in order to gain a high utilization of labour and equipment and therefore minimize idle time." Balancing may be achieved by rearrangement of the work stations or by adding machines and / or workers at some of the stations so that all operations take about the same amount of time.

**Line Balancing Procedure in Assembly Layouts:**

**Step 1:** Determine what tasks must be performed to complete one unit of a finished product and the sequence in which the tasks must be performed. Draw the precedence diagram.
**Step 2:** Estimate the task time (amount of time it takes a worker to perform each task).
**Step 3:** Determine the cycle time (the amount of time that would elapse between products coming off the end of the assembly line if the desired hourly production were being produced.)
**Step 4:** Assign each task to a worker and balance the assembly line. This process results in determining the scope of each worker's job or which tasks that he or she will perform.

**6(a) The number of breakdowns of equipment over the past 2 years below:**

| No. of Break downs | No. of month this occurred |
|---|---|
| 0 | 3 |
| 1 | 7 |
| 2 | 9 |
| 3 | 3 |
| 4 | 2 |
| Total | 24 |

**Each break down costs an average of ₹ 300. Preventive maintenance service can be hired at a cost of ₹ 150 per month and it will limit the breakdowns to an average of one per month. Which maintenance arrangement is preferable, the current break down maintenance policy or a preventive maintenance service contract?**

**(b) Describe the objectives of Human Resource Planning. [10+2]**

**Answer of 6:**
**(a) Step 1: Calculation of probability distribution of break downs:**

| No. of breakdown (x) | Frequency in month f (x) | Probability of breakdown P(x) |
|---|---|---|
| 0 | 3 | 3/24 = 0.125 |
| 1 | 7 | 7/24 = 0.292 |
| 2 | 9 | 9/24 = 0.375 |
| 3 | 3 | 3/24 = 0.125 |
| 4 | 2 | 2/24 = 0.083 |
| Total | 24 | 1.000 |

**Step 2: Calculation of expected value of breakdowns:**

| Probability of breakdown P(x) | No. of breakdown (x) | Expected value of breakdowns [x. P(x)] |
|---|---|---|

| | | |
|---|---|---|
| 0.125 | 0 | 0 |
| 0.292 | 1 | 0.292 |
| 0.375 | 2 | 0.750 |
| 0.125 | 3 | 0.375 |
| 0.083 | 4 | 0.332 |
| Total | | 1.749 = 1.75 |

**Step 3: Calculating of breakdown cost:**
Expected breakdown cost = (1.75 break-downs per month) x (cost per break-down)
= 1.75 x 300
= ₹ 525 per month

**Step 4: Cost of preventive maintenance service contract per month**
= ₹ 150 + ₹ 300 (i.e., cost of one breakdown per month) = ₹ 450
Savings due to preventive maintenance service contract = ₹ 525 – ₹ 450 = ₹ 75 per month.

Since there is a saving of ₹ 75 per month by entering into preventive maintenance service contract, it is preferable to go for preventive maintenance service contract.

**(b) Objectives of Human Resource Planning:**
- To understand the concept and nature of human resource planning a base for human resource management practices. The process involved in human resource planning.
- To understand process involved in human resource planning.
- To make the forecast of human resource needs and their availability in the organization in the future.
- To understand the time dimension of human resource plans.
- To identify the barriers to effective human resource planning and
- To adopt measures to overcome these.

## Section – B

**Question no. 7 is compulsory and any four questions from the**

**7. (a) List the function of a Query Compiler.**
**(b) Define Black Box Testing in relation to System Testing.**
**(c) Describe the term Commerce Net in brief.**
**(d) State the use of Electronic Data Interchange. [2×4]**

**Answer of 7:**

**(a)**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)Black Box Testing:** The test designer selects valid and invalid inputs and determines the correct output. If a module performs a function which is not supposed to, the black box test does not identify it as it is not concerned with the internal structure. Thus in black box testing, it has no relation with the internal functioning of a system.

**(c) Commerce Net** is a consortium of companies which is promoting the use of internet for E-commerce. Sponsored by Silicon Valley vendors and US government agencies, it was launched in 1994 with the aim of creating infrastructure for business-to-business transactions on the internet. Today, it has over 120 members and helps companies to streamline their procurement and development cycles by performing transactions

online, overcome impediments to e-Commerce by making new interfaces, security mechanisms and indexing tools.

**(d) Electronic Data Interchange** (EDI) is used in following ways:

EDI is used to electronically transfer documents such as purchase order, invoices, shipping notices, receiving advises and other standard business correspondence between the trading partners.

EDI can also be used to transmit financial information and payment in electronic form. However, where EDI is used for effecting payment it is commonly known as financial EDI or electronic funds transfer

**8. (a) Enumerate the disadvantages of Database Management System. [6]**
**(b) Discuss the risks associated with System development Life Cycle. [2]**

**Answer of 8:**

**(a)** In spite of the advantages of using a Database Management System (DBMS), there are a few situations in which such a system may involve unnecessary overhead costs as that would not be incurred in traditional file processing.

The overhead costs of using a DBMS are due to the following:

- High initial investment in hardware, software, and training.
- Generality that a DBMS provides for defining and processing data.
- Overhead for providing security, concurrency control, recovery, and integrity functions.

Additional problems may arise if the database designers and Database Administrator (DBA) do not properly design the database or if the database systems applications are not implemented properly.

Hence, it may be more desirable to use regular files under the following circumstances:

- The database and applications are simple, well defined, and not expected to change.
- There are stringent real-time requirements for some programs that may not be met because of DBMS overhead.
- Multiple-user access to data is not required.

**(b) Risks Associated with SDLC**

Some of the shortcomings of the SDLC are as follows:

(i) The development team may find it cumbersome,
(ii) The users may find that the end product is not visible for a long time,
(iii) It may not be suitable for small and medium sized projects

**9. Explain the term Information System Infrastructure. [8]**

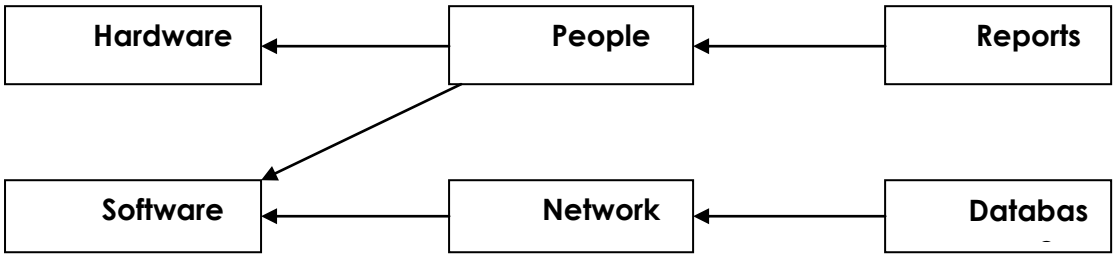
**Answer of 9:**

**Information System Infrastructure**

Information System Infrastructure means the physical resources and organizational support required for operation of an information system. It consists of following six basic components:

- Hardware – Devices which store software, database and process data
- Software – Programs process data to generate reports
- Database – Data collected is stored in databases
- Network – Technology for sharing the data and other hardware resources
- People – Human resources to make the system operational.

Reports – Reports are generated by the software with the help of databases for the use by users (people).




The role of information system architecture is to support and reinforce the organization structure and decision making mechanism. If we accept that IT can change the performance of an organization, the real challenge before the management is to ensure the management that the components of IS architecture provides the most suitable solution in the environment under which an organization works. The change management is the most critical issue and change in the architecture should be taken up well before the technology becomes obsolete.

Following are required to develop a good Information System Infrastructure:

- Management has to ensure the most suitable hardware and suitable to fulfill the information requirement for decision making;
- The choice between centralized processing or distributed processing has to be made first;
- The architecture design is dominated by issue of compatibility of hardware platform and software package;
- Assessment of hardware configuration on the basis of volume of data and type of processing need is required;
- It is to be ensured that the software requirement is compatible with hardware;
- Networking and communication technology is another requirement;
- Proper maintenance of database;
- Assessment of investment requirement and phasing the investment is necessary;
- Personnel involved in Information system must be properly trained on the pattern of functioning of the organization, change needed, plan for changes, stages of transformation and actions plan for the same. The policies of the relevant issues are to be framed to achieve the objectives. Training, Restructuring, Retention of employees etc are required;
- Vendor selection and Procurement plan is required;
- Proper support of all the above components can generate proper repots.

**10. (a)State the meaning of Program Debugging and list the steps involved in Debugging. [2+4]**
**(b) Define Computer Network. [2]**

**Answer of 10:**
**(a) Program Debugging:**
Debugging is the form of testing activity which refers to correcting programming language syntax and diagnostic errors so that the program compiles cleanly and thus in this process, errors are found and then they are corrected.

Debugging consisting of following four steps:

(i) Inputting the source program to the compiler.
(ii) Letting the compiler find errors in the program.
(iii) Correcting lines of code that are erroneous.
(iv) Resubmitting the corrected source program as input to the compiler.

**(b)** "**Computer Network**" - The interconnection of one or more, computers through
(i) The use of satellite, microwave, terrestrial line or other communication media and
(ii) Terminals or a complex consisting of two or more interconnected computers whether or not the interconnection is continuously maintained.

**11. Level of Management activity has a clear impact on the information requirements of executives, Discuss. [8]**

**Answer of 11:**

Information requirement varies with the level of management and purpose. The levels of management in the order of hierarchy are Top Management, Middle Management and Operational Management. The activities of different levels of management are given below:

**Top Management:** Top management is concerned with strategic decisions like diversification, technology acquisition, new market exploration, strategic business alliance, takeover, merger etc.

**Middle Level:** Middle level management is generally involved tactical decision making with the help of performance analysis, budget variance analysis, devising better productivity mechanism and control etc.

**Operational Management:** Operational Management staff are mainly involved in scheduling the activities, keeping track of progress of day-to-day operations and decisions of well structured problems etc.

The characteristics of information naturally vary depending on the functions of different levels of management. They are as given below:

**Strategic-level information systems** help senior management to tackle and address strategic issues and long-term trends, both within the firm and external environment. Their principal concern is matching changes in the external environment with existing organizational capability - What will be the cost-trends, where will our firm fit in, what products should be made etc ? In other words, these systems are designed to provide top-management with information that assists them in making long –range planning decisions for the organization.

**Tactical-level information systems** serve middle level managers and help in taking decisions for a period of 2-3 years. The managers are typically concerned with planning, controlling and use summaries of transactions to aid their decision - making. In other words, these systems provide middle-level managers with the information they need to monitor and control operations and to allocate resources more effectively. In tactical systems, transactions data are summarized, aggregated, or analyzed. Their purpose is not to support the execution of operational tasks but to help the manager control these operations.

**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 organizations such as sales, receipts, cash deposits, flow of materials etc. Their purpose is to answer routine questions and to track flow of transactions. Thus, the primary concern of these systems is to collect, validate, and record transactional data describing the acquisition or disbursement of corporate resources. Thus, each type of information system serves the requirements of a particular level in the organization, providing the needed basis for decision making.

**12. How the Corporate Strategy be linked with Information System Strategy? [8]**

**Answer of 12:**

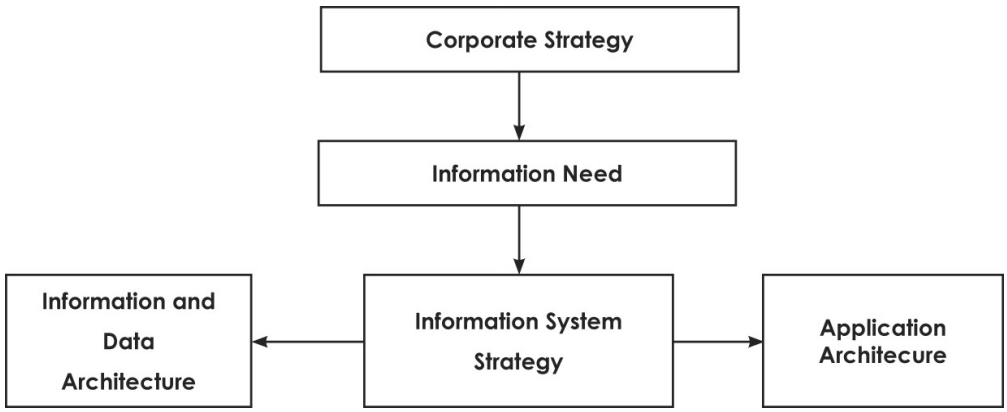
**Linking Corporate Strategy with Information System Strategy**

The basic objective of information system strategy is to exploit Information Technology (IT) to provide best advantage for the organization.

The following are required before venturing into designing an information system:

(i) Identification of sub-systems involved and their interactions;
(ii) Level of Management
(iii) Decision making process

On the other hand, success of corporate strategy depends on decision making skill. This is supported by an efficient information system. Decisions at different levels of management vary and the information varies accordingly. There is a link between the Information System Strategy and the Corporate Strategy. The link is explained through the diagram below:




**Information and data architecture is based on the following:**
**It is needed to understand the-**

- Information need for the organization for corporate decision making
- Who will provide the data and who will use it?
- When and how data will be collected.
- How should the data be stored to provide easy access?

**Application Architecture**

Application architecture development requires the evaluation of the application software requirement in the consideration with the following:

- What application software is required?
- What is the most logical sequence of operations?

**Decision Making Process requires the following:**

The important process in the planning is how to improve the use of information in efficient decision making to formulate business strategy. For doing this, through review of the current system and procedure for Information Management is essential which involves the review of the following:

- Current work volume;
- Current application software and their life cycles;
- Current technology environment and skill level;
- Current performance of Information system;
- User satisfaction;
- Current Business Process and information structure.