Paper 9 - Operations Management & Information Systems

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

Section I
(Operations Management)
Answer Question No. 1 which is compulsory and answer any two from the rest, under Section I.

Working Notes should form part of the answer.

1. **(a) State whether the following statements are true or false:**   **(1 x 7 =7)**

    (i) Plastic coating is less durable than painting.
    (ii) A work stoppage generally reduces the cost of production.
    (iii) Annealing involves heating and cooling operations.
    (iv) A transistor is a semiconductor device commonly used as an amplifier or an electrically controlled switch.
    (v) In a network analysis, a job which the slack time is zero is known as non-critical job.
    (vi) Decisions under uncertainty are not always obvious.
    (vii)Quality of lot submitted for inspection is the percentage of defectives actually present in it.

    (b) Expand the following abbreviations: **(1 x 7 =7)**

    (i) CAE
    (ii) LTPD
    (iii) LRC
    (iv) BCWS
    (v) CPOF
    (vi) COPQ
    (vii)WBS

Answer:

1. (a) (i)   False   -   Plastic coating is more durable then painting.
        (ii)   False   -   Work stoppage do not reduce the cost of production.
        (iii) True   -   Annealing involves heating and cooling operations.
        (iv)   True   -   A transistor is a semiconductor device commonly used as an
                               Amplifier or an electrically controlled switch.
        (v)   False   -   Slack time is zero for critical jobs
        (vi)   True   -   Decisions under uncertainty are not always obvious.
        (vii) False   -   Quality of lot submitted for inspection provides the details of
                                 defectives actually present in it.

    (b) (i)   Computer Aided Engineering
        (ii)   Lot Tolerance Percentage Defective
        (iii) Linear Responsibility Chart
        (iv)   Budgeted Cost of Work Schedule
        (v)   Capacity Planning Using Overall Factors
        (vi)   Cost of Poor Quality

(vii)   Work Breakdown Structure

2. (a) An electric company which generates and distributes electricity conducted a study on the life of poles. The repatriate life data are given in the following table:

Life data of electric poles

Year after installation:	1	2	3	4	5	6	7	8	9	10
Percentage poles failing:	1	2	3	5	7	12	20	30	16	4

(i) If the company now installs 5,000 poles and follows a policy of replacing poles only when they fail, how many poles are expected to be replaced each year during the next ten years?
To simplify the computation assume that failures occur and replacements are made only at the end of a year.

(ii) If the cost of replacing individually is ₹ 160 per pole and if we have a common group replacement policy it costs ₹ 80 per pole, find out the optimal period for group replacement.   **7**

(b) A confectioner sells confectionery items. Past data of demand/week in hundred kilograms with frequency is given below:

Demand/week	0	5	10	15	20	25
Frequency	2	11	8	21	5	3

Using the following sequence of random numbers, generate the demand for the next 10 weeks. Also find out the average demand per week.
Random Numbers: 35, 52, 13, 90, 23, 73, 34, 57, 35, 83.   **7**

(c) A department of a company has to process a large number of components/month. The process equipment time required is 30 minutes/component and the manual skilled manpower required is 10 minutes/component. The following additional data is available:

	Availability/month	Efficiency of utilization
Equipment hour	400	80%
Skilled manpower hours	250	65%

What is the maximum possible production under the current conditions?   **4**

Answer:

2. (a) Chart showing Optimal Replacement Period
Average life of the pole - 1 x 0.01 + 2 x 0.02 + 3 x 0.03 + 4 x 0.05 + 5 x 0.07 + 6 x 0.12 + 7 x 0.20 + 8 x 0.3 + 9 x 0.16 + 10 x 0.04 = 7.05

No. of poles to be replaced every year = $\dfrac{5000}{7.05}$ = 709

Average yearly cost on individual replacement = 709 x ₹160 = ₹ 1,13,440.
Group Replacement: Initial Cost = 5,000 x ₹80 = ₹4,00,000.

Year	No. of poles to be replaced	Yearly cost (₹)	Cumulative Cost (₹)	Total cost (₹)	Average Annual Cost (₹)
1	5,000 x 0.01 = 50	8,000	8,000	4,08,000	4,08,000

2	5,000 x 0.02 + 50 x .01 = 101	16,160	24,160	4,24,160	2,12,080
3	5,000 x 0.03 + 50 x 0.02 + 101 x 0.01 = 152	24,320	48,480	4,48,480	1,49,493
4	5,000 x 0.05 + 50 x 0.03 + 101 x 0.02 + 152 x 0.01 = 256	40,960	89,440	4,89,440	1,22,360
5	5,000 x 0.07 + 50 x 0.05 + 101 x 0.03 + 152 x 0.02 + 256 x 0.01 = 362	57,920	1,47,360	5,47,360	1,09,472
6	5,000 x 1.2 + 50 x 0.07 + 101 x 0.05 + 152 x 0.03 + 256 x 0.02 + 362 x 0.01 = 6023	9,63,680	11,11,040	15,11,040	2,51,840

Optimal replacement at the end of the 5th year.

(b)

Demand/Week	Frequency	Probability	Cumulative Probability	Random Interval LL	Random Interval UL
0	2	0.04	0.04	0	3
5	11	0.22	0.26	4	25
10	8	0.16	0.42	26	41
15	21	0.42	0.84	42	83
20	5	0.1	0.94	84	93
25	3	0.06	1	94	99

Week	R. No.	Demand
1	35	10
2	52	15
3	13	5
4	90	20
5	23	5
6	73	15
7	34	10
8	57	15
9	35	10
10	83	15
Total		120
Average Demand		12

(c) Calculation of Maximum Production Possible

<u>From Equipment Hour</u>
Availability = 400 hours
Efficiency = 80%

∴ Actual Usage of hours = 400 x 80% = 320 hours

∴ Maximum Production possible = $\dfrac{320 \times 60}{30}$ = 640 components

From Skilled Man Power
Availability = 250 hours
Efficiency = 65%

∴ Actual Usage of hours = 250 x 65% = 162.5 hours

∴ Maximum Production Possible = $\frac{162.50 \times 60}{10}$ = 975 Components

∴ Maximum Production Possible with Combination of Equipment hour and skilled Man power = 640 Components (Lower of the above two)

3. (a) List the basic steps in Strategic Bench trending.   5
(b) Explain the term "Idea Generation".   4
(c) Explain how Technology and Economics interact with each other?   5
(d) What are the elements of lean production?   4

Answer:

3. (a) The Steps in strategic bench trending are as follows:
    (1) Firstly the market is defined by determining its size, customer preferences, competitors and relative business position of the company within the market.
    (2) The industry direction, technology shifts, geopolitical changes, customer changes and potential threats from outside sources are assessed.
    (3) The strongest current and potential competitors are then determined by evaluating the trends in industry.
    (4) Data on preference of competitors is gathered and the current and future performance of the unit is compared with that of its competitor.
    (5) A performance baseline for the business units, is then established and the relative performance of current and projected competition is estimated.
    (6) A set of initiatives which form the basis of an improvement plan are identified to maintain strengths while reducing projected gaps.

    (b) The first stage of the new product's evaluation begins with an idea for the product. Hence, this stage is also termed as 'Idea Generation'. Ideas may originate from the following sources:
    • Own Research and Development Department,
    • Distributors,
    • Competitors, and
    • Professional Inventors.

    All the ideas may not have immediate market potential. At the same time, a firm must always keep a collection of ideas ready in stock, because the creation of new products is a condition of survival in many industries. The specific activities performed in this stage are:
    (1) Determining the product fields of interest to the company,
    (2) Establishing a programme for planned idea generation, and
    (3) Collecting ideas through an organized work.

    (c) Technology and Economics
    There are many ways in which Technology and Economics interact. Two of them are of direct relevance in the present context.

        (a) First, the popular and common understanding that all technological efforts not only have economic motives as their ultimate ends but they also need the economic evaluation.

(b) Secondly, technology is the last resort for improving the competitive strength of firms as well as nations in the market.

The former may be termed as the role of Economics in technological efforts, that is R&D. This has three important aspects (i) objectives of R&D, that is, the commercial exploitation of inventions; (ii) Economics of R&D, that is, the costs and benefits of R&D efforts; and (iii) R&D as an investment decision.

The second way of interaction between Technology and Economics emphasizes the role of technology in economic decision making, which is done at two levels – the firm and the economy as a whole. At the macro level, growth models have very well assimilated the role of technology. At the micro or the firm level, the role of technology in improving factor productivity is evaluated by empirical production functions. Some efforts are also made to measure its pure effect by segregating if from that of the technology imbibed in capital equipment.

(d) The elements of lean production are:
   (i) To consider the organization in terms of a supply chain of value streams that extends from suppliers of raw materials, through transformation to the final customer.
   (ii) To organize workers in teams and to have everyone in the organization conscious of his or her work
   (iii) To produce products of perfect quality and to have continuous quality improvement as a goal.
   (iv) To organize the operation by product or cellular manufacturing, rather than using a functional or process lay-out.
   (v) To operate the facility in a just-in-time mode.

Just-in-time is a key element of lean production, (conceived by Taiichi Ohno, the former president of Toyota Motor Co. of Japan in the 1980's). The Japanese manufacturing success, with increased productivity, low product cost and often superior quality products can very much be attributed to JIT manufacturing.

4. **(a) Draw the network for the following activities and find critical path and total duration of project.**

| Activity	Duration (months)	Activity	Duration (months)
1-2	2.5	4-5	2.0
2-3	2.5	5-6	3.0
2-4	1.5	6-7	1.5
3-4	1.0	5-7	1.5
3-5	1.0		

8

(b) What are the merits of Delphi method of forecasting technique? **5**
(c) Calculate EBQ from the details: Monthly demand -4000 units, setting up costs per batch - ₹200, cost of manufacture per unit - ₹60, rate of interest – 10% p.a. **3**
(d) What are the disadvantages of Vertical Integration? **2**

Answer:

4. (a)
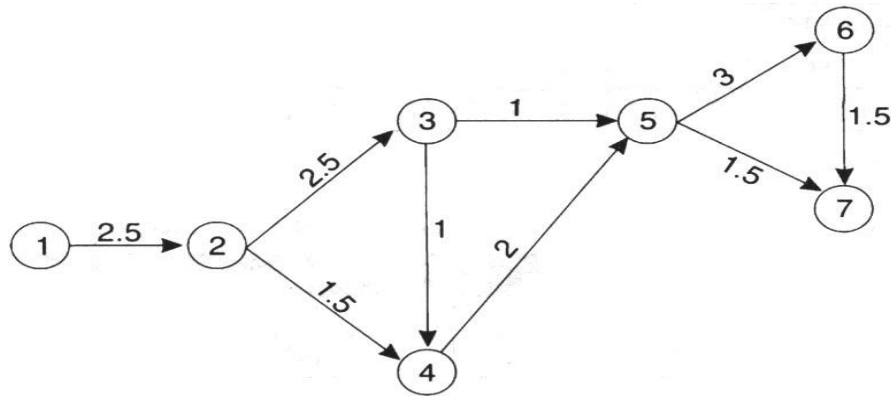
Paths	Duration
1-2-3-5-6-7	2.5+2.5+1+3+1.5 = 10.5
1-2-3-5-7	2.5+2.5+1+1.5 = 7.50
1-2-3-4-5-6-7	2.5+2.5+1+2+3+1.5 = 12.5 (Critical path)
1-2-3-4-5-7	2.5+2.5+1+2+1.5 = 9.5
1-2-4-5-7	2.5+1.5+2+1.5 = 7.5
1-2-4-5-6-7	2.5+1.5+2+3+1.5 = 10.5

(b) The merits of Delphi method of forecasting technique is as follows:
- It involves knowledgeable persons on the subject.
- Members in Delphi exercise come from different backgrounds and therefore the method is able to consider and pool up various aspects of the issue.
- Since the members do not meet each other, their views are not influenced by the views of others.
- No conflict of personality is seen in the process.
- No dominance by any influential expert on the other experts.
- It gives quick results as compared to quantitative techniques and helps in timely decisions.

(c)
$$EBQ = \sqrt{\frac{2 \times Annual\,Demand \times Set\text{-}up\,Cost}{Unit\,Cost \times Inventory\,Carrying\,Cost\,per\,unit\,per\,year}}$$

$$EBQ = \sqrt{\frac{2 \times 4000 \times 12 \times 200}{60 \times 10\%}}$$

$$= 1789\ units$$

(d) Disadvantages of vertical integration are:
- Not attractive for low volumes.
- High capital investment and operating costs.
- Less ability to react more quickly to changes in customer demands, competitive actions and new techniques.

Section II
Information System
Answer Question No. 5 which is compulsory and answer any two from the rest, under Section II.

5. (a) Fill in the blanks given below :   **(1 x 10 =10)**

(i) An ------------ software does the analysis of information from data warehouse.
(ii) The basic aim of ---------------- in data structure is to eliminate redundancy and inconsistent dependency.
(iii) Tree topology is a combination of --------- topologies.
(iv) ---------------- is the reverse process to convert the scrambled form of text into readable text.
(v) Half-duplex is a mode of data ---------------.
(vi) DBMS reduces data --------------.
(vii) ----------- file contains the information which are permanent in nature.
(viii) ------------ which is made up of dummy transaction data containing both valid and invalid conditions.
(ix) Electronic data interchange is the ------------- transmission of data between organizations by electronic means.
(x) -------------- means that due to digital revolution almost all digital devices can communicate with one another.

(b) Expand the following abbreviations: **(1 x 4 =4)**
   (i) BPM
   (ii) UoD
   (iii) ISAM
   (iv) URL

Answer:

5. (a) (i)   OLAP
        (ii)   Normalisatation
        (iii) Bus
        (iv)   Decryption
        (v)   Transmission
        (vi)   Redundancy
        (vii) Master
        (viii) Test Deck
        (ix)   Structured
        (x)   Digital convergence

    (b) (i)   Business performance management
        (ii)   Universe of Discourse
        (iii) Indexed Sequential File
        (iv)   Uniform Resource Locator

6. Write short notes: **(2 x 9 =18)**
   (a) Entity Integrity
   (b) Normalization
   (c) Procedural DML
   (d) Conceptual Schema
   (e) Virtual Reality
   (f) DDP
   (g) Automated Storage and Retrieval Systems (ASRS)
   (h) Deterministic system
   (i) Executive Information System (EIS)

Answer:

6. (a) Entity Integrity
     Entity Integrity constraint states that no primary key value can be null. This is because the Primary Key value is used to identify individual tuples in a relation Null values for the Primary Key implies that we cannot identify some tuples.

    (b) Normalization:
     Normalization is a process of organizing data in a database. The fundamental principle of normalization is that the same data should not be stored in more than one place. The basic aim of normalization in data structure is to eliminate redundancy and inconsistent dependency. The design of database with greater level on normalization provides better efficiency.

    (c) A low-level or procedural DML must be embedded in a general-purpose programming language. This type of DML typically retrieves individual records or objects from the database and processes each separately.

    (d) The conceptual level has a conceptual schema, which describes the structure of the whole database for a community of users. The conceptual schema hides the details of physical storage structures and concentrates on describing entities, data types, relationships, user operations, and constraints. A high-level data model or an implementation data model can be used at this level.

    (e) Virtual Reality
     Virtual reality is an artificial environment that is created with software and presented to the user in such a way that the user suspends belief and accepts it as a real environment. This tool is being though of to be useful in advertising in web-sites for an effective e-commerce business.

    (f) DDP stands for "Distributed Data Processing".

     The Distributed Systems is the opposite to the centralized system:
     (1) Computers installed at different sites
     (2) Each of them performing independent data processing
     (3) Each computer is specialized to perform a range of activities (marketing, promotion……...)

    (g) Automated Storage and Retrieval Systems: Computer controlled warehouses use ASRS; which provide for the automatic placement and withdrawal of parts and products into and from designated storage places in the warehouse. Such systems are commonly used in distribution facilities of retailers.

    (h) 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.

    (i) Executive Information System (EIS) is special type MIS meant for top management of an organization. In other words, it is a Decision Support System (DSS) for executives.

Executive decisions are of three types – strategic planning, tactical planning and fire-fighting.

7. (a) **Write down the importance of Marketing Information System.**   **5**
    (b) **Mention the characteristics of good quality information.**   **3**
    (c) **State the concept of Search Engines.**   **4**
    (d) **"Quality can be viewed as hinging on two major factors." What are the factors?**   **2**
    (e) **List the General Mode of Configuration.**   **4**

Answer:

7. (a) Importance of Marketing Information System
    * Anticipation of Customer Demand – Every marketer needs up-to-date knowledge about consumer needs and wants.
    * Systematic Approach – Expanding markets and competitive marketing environment require adequate market intelligence system.
    * Economic indicator – Marketers must have latest information on the changing trends of supply, demand and prices.
    * Significance of Analysing Competition – Marketer cannot survive without having information regarding nature, character and size of competition to be met.
    * Development of Technology – Marketers must have latest information regarding technological development.
    * Understanding the Consumer – Information system can establish proper two way flow of information and understanding between marketers and consumer.
    * Marketing Planning – Marketing plans and programmes are based upon information supplied by economic forecasts and market research.

    (b) Good Quality Information
    The characteristics of good quality information – it should be:
    * Accurate
    * Up-to-date
    * Relevant
    * Complete
    * On-time
    * Appropriately presented
    * Intelligible

    (c) Search Engines
    Search Engine is a program that searches documents for specified keywords and returns a list of the documents where the keywords were found. Although search engine is really a general class of programs, the term is often used to specifically describe systems like Google, Yahoo, etc. that enables users to search for documents on the www and Usenet, newsgroups.

    Typically, a search engine works by sending out a robot, spider or crawler program to fetch as many documents as possible. A robot is a piece of software that automatically follows hyperlinks from one document to and creates an index based on the words contained in each document. Each search engine uses a proprietary algorithm to create its indices such that, ideally, only meaningful results are returned for each query. Broadly, there are two type of search engines:

(i) Individual: Individual search do not compile their own searchable databases on the web.

(ii) Meta: Meta-searchers do not compile databases. Instead, they search the databases of multiple sets of individual engines simultaneously.

(d) Quality can be viewed as hinging on two major factors:
   (i) Satisfying customer expectations regarding the attributes and performance of the product.
   (ii) Ensuring that the technical aspects of the product's design conform to the manufacture's standards.

(e) Configuration of an ERP system deals with handling of numerous usage controls, which can be switched off or switched on, so as to balance its functionalities to extant needs. General Mode of Configuration:
   • A function can be turned on or turned off or made optional.
   • XOR i.e. chooses only one flow that fulfills the specified condition.
   • OR where a configuration supports optional activities or flow requiring all, none or some of the activities.
   • AND-indicate mandatory parallel flows.

8. **(a) What are the important activities related to setting up of base in ERP System?** **6**
   (b) State where the Information Technology Act, 2000 is not applicable. **6**
   (c) What are the advantages of Computer Based Information System (CBIS)? **4**
   (d) Define Electronic Financial Transaction (EFT). **2**

Answer:

8. (a) Setting up of basic system: Some important activities related to setting up of base system, having impact on all modules, are given below:
   (i) Creation of a company: This is basically to create a data base. A number of data bases can be created to which one may be for actual transactions where as the others may be used for testing and training. A Company may have different hierarchies such as single logistics/single finance, multi logistics/single finance, multi logistics/multi finance etc.
   (ii) Setting up of currency: Currencies need to be configured as (i) base currency which is the legal currency of the country where the organization is operating (ii) Alternate reporting currencies, (iii) transaction currencies used for transaction with vendors and customers who may be spread over a number of countries.
   (iii) Setting up of calendar and periods: Calendars are used to record information on the availability of resources. Periods are time intervals that can be utilized for statistical, financial, planning and cost control purpose.
   (iv) Units of Measure: Base units of length, surface area, weight, time and their conversation factors for transactional purpose.
   (v) Integration between finance and logistic: Setting up of inter company relations, mode of updating finance tables either in real time or in batch mode, mode of inventory valuation such as LIFO, FIFO, Standard Costing or Weighted Average, treatment of finalized and non finalized transactions on financial ledger etc.
   (vi) Defining number group, series type and series length: To be used as ID of a unique transaction like purchase orders, sales order, production order etc.

(vii) Defining Countries: Customers and vendors are located in various countries for which country code need to be defined. This is very important due to necessity of tax calculation and reporting.

(viii) Assigning Tax Codes: needed to be defined for sales, purchase, service, project transactions.

(b) The Act shall not be applicable to the following:

- a negotiable instrument as defined in Section 13 of the Negotiable Instruments Act, 1881;
- a Power of Attorney as defined in Section 1A of the Powers-of-Attorney Act, 1882;
- a trust as defined in Section 3 of the Indian Trusts Act, 1882;
- a will as defined in Section (h) of Section 2 of the Indian Succession Act, 1925 including any other testamentary disposition by whatever name called;
- any contract for the sale or conveyance of immovable property or any interest in such property;
- any such class of documents or transactions as may be notified by the Central Government in the Official Gazette.

(c) The advantages of CBIS are:
(i)   Reduction in cost of record maintenance
(ii)   Improvement in the efficiency of human resources
(iii)   Regular flow of information at different levels of management
(iv)   Easy use of scientific tools and models for quality decision making
(v)   Faster response to customers
(vi)   Better control over resources
(vii) Faster access to records in case of dispute
(viii) Effective use of manpower etc.

(d) Electronic Financial Transaction (EFT) refers to a process by which money is transferred from one person's bank account to another person's account electronically rather than using a cheque or transferring cash. Of course, these electronic transfers are also available to governments and businesses.

The types of Electronic Transactions are:
(a) Direct Deposits
(b) Direct Payments
(c) Online Banking or Internet Banking or E-banking.