Paper 9- Operation Management & Information Systems

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Full Marks : 100 **Time allowed: 3 hours**

Section – A

I. Answer the following question which is compulsory:

1. Answer any five of the following questions. **[5×2=10]**

(a) What is lead time?

Solution:

It is the time gap between order giving and goods/service receiving. Organizations always want to reduce Lead time.

(b) Define product mix.

Solution:

Production of number of products affects the demonstrated capacity of the process as each product needs setup time. Setup for a new product might require setting of machines, change in process parameters, and cleaning the facility to change over form the product to another product. A diverse product mix requires many such changes, which reduces the demonstrated capacity.

(c) Define routine maintenance.

Solution:

This includes activities such as periodic inspection, cleaning, lubrication and repair of production equipments after their service life. Routine maintenance may be classified as:

1. Running maintenance in which the maintenance work is carried out while the equipment is in the operating condition (i.e. performing some operation) e.g greasing or lubricating the bearing while the machine is running.
2. Shut down maintenance in which the maintenance work is carried out when the machine or equipment is out of service i.e. after shutting down the machine or equipment, e.g. repairing (i.e. decaling) boiler tubes of a boiler.

(d) What does sigma value indicates?

Solution:

The sigma value indicates how often defects are likely to occur. The higher the sigma value, the less likely a process will produce defects. As sigma value increases, costs go down, cycle time goes down and customer satisfaction goes up.

(e) What KAIZEN mean?

Solution:

KAI means change and ZEN means better. Thus KAIZEN means change for the better. implies continuous improvement done consistently.

(f) What is open system?

Solution:

1. An open system is one which interacts with its environment and can change itself to accommodate the changes in factors like customers performance, price, product design etc.
2. The adoptability of an open system is judged by its capability in modifying the operational parameters of the system accordingly.
3. It takes input from outside and exports output to outside.
4. For example, Human body changes as per weather conditions.
5. If a system accommodate all the changes in the environmental factors as and when required, is said to be perfectly open system.

(g) Define primary key.

Solution:

Primary key: Primary key is a set of one or more fileds/colums of a table that uniquely identify a record in database table. It cannot accept null, duplicate values. Only one candidate key can be primary key.

(h) What is Iconic model?

Solution:

Iconic Model:
It is physical replica of the system based on different scale from original, iconic models may appear to scale in three dimensions – such as model of a production process, building, car or an aircraft.

2. Match the following: **[5×2=10]**

List A	List B
A. Inventory control	**(i) Maintenance store**
B. Availability of vital spare parts essentially To meet an emergency like break down	**(ii) stock level**
C. Voluntary group to identify problems	**(iii) Acceptance test**
D. Knowledge base	**(iv) quality circle**
E. Carried out by end user	**(v) expert system**

Solution:

A. — (ii)
B. — (i)
C. — (iv)
D. — (v)
E. — (iii)

3. Statement whether the following statements are True/False: **[5]**

(a) An operating system is defined as a configuration of resources for the provision of goods or services.
(b) Product layout is also known as straight line layout.
(c) Private key is used to create a digital signature.
(d) Database approach increasing redundancy.

(e) Readymade software is one, which meets the full – customized requirements of a specific organization.

Solution:

(a) True
(b) True
(c) True
(d) False
(e) False

4. Fill in the blanks with one word or two: [5×1=5]

(a) Efficiency = (_____ / actual hours) x 100.
(b) _____ study is concerned with the determination of the amount of time required to perform a unit of work.
(c) Processed data is known as _____
(d) Data which described about another data is _____.
(e) Database management is responsibility of _____.

Solution:

(a) Standard hours;
(b) Time;
(c) Information;
(d) Meta data;
(e) DBA.

Section – B

II. Answer any three questions from the following: [15×3=45]

1. (a) Machines A and B are both capable of processing the product. The following information is given:

Particulars	Machine A	Machine B
Investment	**₹ 75,000**	**₹ 80,000**
Interest on capital Invested	**10%**	**15%**
Hourly charge (wage + power)	**₹ 10**	**₹ 8**
Pieces produced per hour	**5**	**8**
Annual operating hours	**2000**	**2000**

Which machine will give the lower cost per unit of production, if run for the whole year? If only 4000 prices are to be produced in a year, which machine would give the lower cost per piece? [6]

Solution:

Particulars	Machine A	Machine B
Investment	` 75,000	` 80,000
Rate of interest	10%	15%
I. Fixed Cost (A)	75000x10%= 7500	80,000x15%=12,000
II. Variable cost:		
Wages & Power /hr	10	8
Annual operating Hrs	2000	2000
Total wages (B)	20,000	16,000

III. Total cost (A+B)	27,500	28,000
IV. No. of units	2000x5=10,000	2,000x8=16,000
V cost/unit	27,500/10,000=2.75	28,000/16,000=1.75

Conclusion: if run for the whole machine-B give the lower cost . So machine – B is most suitable.

If only 4000 pieces are to be produced

Particulars	Machine A	Machine B
Investment	` 75,000	` 80,000
ROI (%)	10%	15%
I Fixed cost (A)	7500	12000
II Operating cost:		
Wages & power /hr	`10	` 8
No.of pieces	4000	4000
Pieces produced/hr	5	8
No.of hours	800 hrs	500 hrs
Total wages & powers	800x10=8000	500x8=4000
III Total cost (I+II)	15,500	16,000
IV. Cost /piece (`)	15,500/4000=3.875	16,000/4000=4

If the 4000 piece are to be produced in a year Machine-A would give the lower cost per piece. So machine – A is most suitable for production of 4000 piece.

(b) From the following time series data of sale project the sales for the next three years.

Year	2009	2010	2011	2012	2013	2014	2015
Sales ('000 units)	**80**	**90**	**92**	**83**	**94**	**99**	**92**

Project the trend values for 2016,2017 and 2018. **[9]**

Solution:

Computation of trade value

Year	Time deviation(X)	Sales (Y) ('000 units)	x^2	xy
2009	-3	80	9	-240
2010	-2	90	4	-180
2011	-1	92	1	-92
2012	0	83	0	0
2013	1	94	1	94
2014	2	99	4	198
2015	3	92	9	276
	∑x=0	∑y=630	$\sum x^2=28$	∑xy=56

Regression equation of Y on X

Y=a+b.x

$$A = \frac{\sum y}{\sum n} = \frac{630}{7} = 90$$

$$b = \frac{\sum xy}{\sum x^2} = \frac{56}{28} = 2$$

Project trend values for

Y 2016 = 90 + 2x4 =98

Y 2017 = 90 + 2x5 =100

Y 2018 = 90 + 2x6 = 102

2. (a) The following jobs are waiting to be processed in a turning shop today (July, 23). The estimates of the time needed to complete the jobs are as follows:

Jobs (j)	Due date	Processing time (t_1) in days
1	**July 31**	9
2	**August 2**	6
3	**August 16**	24
4	**July 29**	5
5	**August 30**	30

Sequence the jobs based on the minimum critical ratio. [7]

Solution:

Job 1	Due date	Processing hire	Critical rate
1	8	9	0.89
2	10	6	1.67
3	24	24	1.00
4	6	5	1.20
5	38	30	1.27

Sequence of the jobs based on the min. critical ratio
Working:

C.R= $\frac{\text{due date}}{\text{processing time}}$

Due date for Job 1= = july 23 – july 31 =8 days

(b) A bakery keeps stock of a popular brand of cakes. Previous experience shows the daily demand pattern for the item with associated probabilities, as given:

Daily demand (no.s)	0	10	20	30	40	50
Probability	0.01	0.20	0.15	0.50	0.12	0.02

Use the following sequence of random numbers to simulate the demand for next 10 days. Also find out the average demand per day
Random Numbers: 25,39,65,76,12,05,73,89,19,49. [8]

Solution:

Computation of random numbers rage:

Daily demand	Probability	Cumulative probability	Range of random No.
0	0.01	0.01	0-0
10	0.20	0.21	1-20
20	0.15	0.36	21-35
30	0.50	0.86	36-85
40	0.12	0.98	86-97
50	0.02	1.00	98-99

Simulation the demand for next 10

Days	Random numbers	Demand
1	25	20
2	39	30
3	65	30
4	76	30
5	12	10
6	05	10

7	73	30
8	89	40
9	19	10
10	49	30
		240

Avg demand = 240/10=24 days

3. (a) Priyanshu enterprise has three factories at locations A, B and C which supply three warehouses located at D,E and F. Monthly factory capacities are 10,80 and 15 units respectively. Monthly warehouse requirements are 75,20 and 50 units respectively. Unit shipping costs (in ₹) are given in the following table.

	To	D	E	F
	A	5	1	7
From	B	6	4	6
	C	3	2	5

The penalty costs for not satisfying demand at the warehouses D,E and F are ₹5, ₹3 and ₹2 per unit respectively. Determine the optimum distribution for priyanshu, using any of the known algorithms. [8]

Solution:

	D	E	F		Penalty		
A	5	1	7				
		10		10/0	4	-	-
B	6	4	6				
	60	10	10	80/20	2	2	2
C	3	2	5				
	15			15/0	1	1	1
D	5	3	2				
			40	40/0	1	1	-

Demand 75/60 20/10 50/10

Penalties:2 1 3
2 1 3
3 2 1

Since there are m+n-1 allocation optimality's test can be performed

	D	E	F	
A	5	1	7	
	2	10 4	-3	
B	6	4	6	
	60	10	10	0
C	3	2	5	
	15	2	-3	
x	5	3	2	
	3	3	40	-4
vj	6	4	6	

As some $\mu i=0$

$\Delta_{ij} = c_{ij} - (\mu_i + v_j) = un\ allocation$

$c_{ij} - (\mu_i + v_j)$ - allocation

Allocation x:-
C_{12} = 1=(-3+4)
C_{21} = 6=(0+6)
C_{22} = 4= (0+4)
C_{23} = 6=(0+6)

Un allocation
Δ_{11} = 5+3-6=2
Δ_{13} = 7-(-3+6)=4
Δ_{32} = 2+3-4=1
Δ_{33} = 5+3-6=2

cal. of min.left
A E = 10x1 = 10
B D = 60x6 =360
K E = 10x4 = 40
F = 10x6 = 60

C_{31} = 3= (-3+6) Δ_{41} = 5+4-6 = 3 C D = 15x3 = 45
C_{43} = 2= (-4+6) Δ_{42} = 3+4-4=3 X F = 40x2 = 80
595

Since
$\Delta_{ij} \geq 0$, the solution is optimum

(b)What are the factors, which influence plant layout? **[7]**

Solution:

Primarily the layout of a plant is influenced by the relationship among materials, machinery and men. Other factors influencing layout are type of product, type of workers, the type of industry management policies etc. Some of these factors are:

Location:
The size and type of the site selected for the plant, influences the type of buildings (single story or multi story) which in turn influences the layout design. Also, the location of the plant determines the mode of transportation form and into the plant (Such as by goods trains, truck, or ship) and the layout should provide facilities for modern of transport used. Also, the layout should provide for storage of fuel, raw materials, future expansion needs, power generation requirements etc.

Machinery and Equipments:
The type of product, the volume of production, type of processes and management policy on technology, determines the type of machines and equipments to be installed which in turn influences the plant layout.

Managerial policies:
Regarding volume of production, provision for future expansion, extent of automation, make –or buy decisions, speed of delivery of goods to customers, purchasing and inventory policies and personnel policies influence the plant layout design.

Materials:
Plant layout includes provisions for storage and handling of raw materials, supplies and components used in production. The type of storage areas, racks, handling equipments such as cranes, trolleys, conveyors or pipelines etc., used – all depend on the type of materials used – such as solid, liquid, light, heavy, bulky, big, small etc.

Product:
The type of product i.e. whether the product is light or heavy, big or small, liquid or solid etc., also influences the type of layout.

Type of industry:
The type of industry and the method of the manufacturing process exercise significant influence on plant layout.

4. (a) Explain various methods of LPP? **[7]**

Solution:

There are number of ways of finding the optimal solution for a given linear programming problems.
(1) Graphic Method
(2) Simplex Method
A part from this some specially structured linear programming problems are solved by methods like
(3) transportation Method

(4) Assignment Method

1. Graphic Method:
This method is generally used for solving the problems having two or three variables. Due to this limitation of handling only two or three variables at a time this has limited application in industrial problems. In practice, two variable cases are easy to solve by this method because three dimensional geometry becomes too complicated to find accurate results.

2. Simple Method:
This is the most powerful and popular method for solving linear programming problems. Any problem can be solved by this method which satisfies the conditions of linearity and certainty irrespective of the number of variables. It is an iterative procedure which ultimately gives the optimal solution.

3. Transportation Method:
This method is used to know the minimum cost of transportation of a product from various origins to different distribution and consumption centers.

4. Assignment Method:
This method is used to determine the optimum allocation of different jobs (n jobs) to different workers (n workers) in such a manner that the total cost/total time for completing all the jobs is minimum (one job is to be assigned to one worker).

(b) What are the major process decision? [8]

Solution:

These major process decisions are discussed in detail in the following paragraphs:
The production manager has to choose from five basic process types – (i) Job shop, (ii) batch (iii) repetitive or assembly line (iv) continuous and (v) project

(i) Job shop process:
It is used in job shops when a low volume of high-variety goods are needed. Processing intermittent, each job requires somewhat different processing requirements. A job shop is characterized by high customization (made to order), high flexibility of equipment and skilled labour and low volume. A tool and die shop is an example of job shop, where job process is carried out to produce one-of a kind of tools. Firms having job shops often carry out job works for other firms. A job shop uses a flexible flow strategy, with resources organized around the process.

(ii) Batch process:
Batch processing is used when a moderate volume of goods or services is required and also a moderate variety in products or services. A batch process differs from the job process with respect to volume and variety. In batch processing, volumes are higher because same or similar products or services are repeatedly provided, examples of products produced in batches include paint, ice cream, soft drinks, books and magazines.

(iii) Repetitive process:
This is used when higher volumes of more standardized goods or services are needed. This types of process is characterized by slight flexibility of equipment (as products are standardized) and generally low labour skills. Products produced include automobiles, home appliances, television sets, computers, toys etc. Repetitive process is also referred to as line process as it include production lines and assembly lines in mass production. Resources are organized around a product or service and materials move in a line flow from one operation to the next according to a fixed sequence with little work-in-progress inventory. This kind of process is suitable to "Manufacture – to stock" strategy with standard products held in

finished goods inventory. However, "assemble t- to order" strategy and "mass customization are also possible in repetitive process.

(iv) Continuous process:
This is used when a very highly standardized product is desired in high volumes. These systems have almost n variety in output and hence there is no need for equipment flexibility. A continuous process is the extreme end of high volume, standardized production with rigid line flows. The process often is capital intensive and operate round the clock to maximize equipment utilization and to avoid expensive shut downs and shut ups. Examples of products made in continuous process systems include petroleum products, steels, sugar, flour, paper, cement, fertilizers etc.

(v) Project process:
It is characterized by high degree of job customization, the large scope for each project and need for substantial resources to complete the project. Examples of projects are building a shopping centre, a dam, a bridge, construction of a factory, hospital, developing a new product, publishing a new book etc. Projects tend to be complex, take a long time and consist of a large number of complex activities. Equipment flexibility and labour skills can range from low to high depending on the type of projects.

Section – C

III. Answer any two questions from the following:

1. (a) Explain characteristics of an information system? [8]

Solution:

The general characteristics of an information system are:

1. **Specific Objective:**
   - The information system should have some specific objective.
   - An information system, in highly scientific research centre, will have an objective to accumulate data from different activities, display of some information instantly for controlling activities and so on.
   - A system without object is useless.

2. **Structured:**
   - The structure of the information system refers to diagrammatic representing of the system showing sub-systems, their inter-relation and the procedure to be followed to fulfill the process requirements.
   - An information system should have a definite structure with all modules of sub-systems.
   - The structure depends on the sub-models, their interactions and integration requirements, operational procedure to be followed and the solution sets.

3. **Components:**
   - The sub-systems are the components.
   - The sub-systems should be distinguishable among themselves but have well-defined relation among them.
   - For example, a sales system may be sub-systems like invoicing, delivery monitoring, and sales proceeds collection system.

4. **Integrated:**
   - An information system should be designed in such a fashion that proper integration among sub-systems are taken care to establish correct linkage and generate meaningful information.

- Information in isolation may not be that meaningful but its usage is improved if it is integrated with information of other closely related issues.
- For example, sales information of a region becomes more meaningful if other information combined in the information set.

5. Life-Cycle:
- An information system will have its own life-cycle.
- The duration of life cycle varies from system to system
- Every information system will have distinctly different phases — Initial, Growth, Maturity and Decline.

6. Behavior:
- A system has its own set of reactions and the outcome depends on its environment.
- A well managed business information system behaves nicely with its users by satisfying them with correct and timely information.
- The design of the system plays a good role in setting its behavior pattern.

7. Self- Regulatory:
- An information system which may have different sub-systems interacting with the each other in a desired fashion to be operative smoothly and in the process they regulate themselves. This is what self-regularly nature of the system.

(b) Discuss fact finding techniques used by a system analyst? [7]

Solution:

Various fact-finding techniques, which are used by the system analyst for determining the needs/requirements of an organization are briefly discussed below:

1. **Documents:**
   Analysts collect the hierarchy of users and manager responsibilities, job descriptions for the people who work with the current system, procedure manuals, program code for the applications associated with the current system to understand the existing system.

2. **Questionnaires:**
   Users and mangers are asked to complete questionnaire about the problems with the existing system and requirement of the new system. Using questionnaires, a large amount of data can be collected.

3. **Interviews:**
   Users and mangers may also be interviewed to extract information in detail.

4. **Observation:**
   Observation plays a key role in requirement analysis. Only by observing how users react to prototypes of a new system, the requirement can be clearly known, the system can be successfully developed.

2. (a) Explain different types of database backups? [8]

Solution:

On-line backups:
It is performed by executing the command-line or form the "Back database" utility. When an on-line backup process begins, the database engine externalizes all cached data pages kept in memory to the database file on disk. This process is called a check point. The database engine continues recording activity in the transaction log file while the database is being backed up. The Log file is backed up after the backup utility finishes backing up the

database. The log file contains all of the transactions recorded since the last database backup. For his reason the log file from an on-line full backup must be applied to the database during recovery.

Live backup:
A live backup is carried out by using the BACKUP utility with the command-line option. A live backup provides a redundant copy of the transaction log for restart of the system on a secondary machine in the event the primary database server machine becomes unusable.

Full database backup:
For a full back-up the database backup utility copies the database and log. A full backup capture all files on the disk or within the folder selected for backup. With a full backup system, every backup generation contains every file in the backup set.

Incremental Backup:
An incremental backup uses the DBBACKUP utility to copy the transaction log file since the most recent full backup. When we perform an incremental backup, the mirror log is not backed up. When we backup and renamed the log files, the transaction and mirror logs file are renamed and a new log files are created. One must plan to manually backup the mirror log.

(b) What are the basic features of an MIS? [7]

Solution:

Basic features of MIS:

(i) Management oriented-
It means the effort for development of the information system should start from an appraisal of management needs and overall business objectives.

(ii) Integrated-
Development of Information should be an integrated one. It means all the functional and operational information sub-system should be tied together into one entity.

(iii) Reliability –
MIS system should provide most reliable information. A thorough check of input information, process follow and output reports on regular and routine basis.

(iv) Flexibility –
MIS should be flexible enough to take care of changes in the environment in the business system.

(v) Consistency –
The input data and output reports must follow some standard norms so that consistency is preserved.

(vi) Timeliness –
One of the most important issues involved in the effectiveness of MIS are flow of information t right time to the user level of management.

(vii) Relevance –
Only relevant information should flow at different levels of management to increase the effectiveness of MIS.

(viii) Simplicity –
An MIS system should be as simple as possible so that people at operation and users do not feel any hazards. The success of a system lies in the acceptance by operation staff and users.

3. (a) Explain ERP with E-commerce? [8]

Solution:

- E-commerce involved buying of goods and selling of goods, service or application through internet.
- E-commerce handles related processes electronically such as receiving invoice, making payment, monitoring performance.
- In E-commerce, customers and suppliers are suppliers are given access to the information through the ERP system itself.
- Consumers want order status and billing information, and suppliers and partners want just about everything else.
- E-commerce transactions can be broadly classified under e-procurement and E-sales.

E-Procurement:

- Electronic tendering comprising of tender publication, submission, short listing, evaluation and award. Facility for evaluation of IT/ service contracts containing complex evaluation matrix.
- Compliance of agreed quantity Vis-a Vis called quantity, consolidation of called quantity for obtaining agreed quantity discounts.
- Facility for a publication and updating of electronic catalogues by vendors.
- Analysis for spend analysis which is used for strategic decisions, supplier relation management and minimization of maverick buying.
- Facilities for reverse auctions through business to business marketplace.

For meeting the above requirement, integration of web based from end with generation of demand (planning module), preparation of purchase order (procurement module), receiving of goods (warehouse module), payment (account payable module), dealt by back and ERP system was done.

E-Sales

- Reaching the customer quickly and a transparent way through the process of electronic auction.
- Processing customer orders promptly through web storefront applications.
- Checking credentials of the customer.
- Arrange drop shipment where the nearest distributor ships goods.
- Providing facility to customer to check status of order through web.

For meeting the above requirements, integration of web system with back end ERP system was done

(b) Explain about EDI? [7]

Solution:

EDI is the system where data is transferred electronically in machine readable or processable form. Here, any message is sent through EDI would be immediately processed by receiving computer without any human intervention or rekeying.

Before EDI following steps were involved in commerce:

Step I: Creation of purchase order (PO) by the customer.
Step II: PO is sent by the customer (sender of the message) using post office fax, telex and so on.
Step III: PO is received by the supplier (receiver of the message)
Step IV: PO is interpreted by the supplier (received)

After Edi following steps were involved in commerce:

Step I: Customers computer system creates and sends the electronic PO.
Step II: Po is received by the supplier (receiver of the message) and places the order directly into his system and he acts accordingly.

Uses of EDI:

EDI is used in following ways:

I. 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.
II. 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.