Answer to MTP_Intermediate_Syllabus2012_Dec2014_Set 2

Paper 9 - Operations Management & Information System

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

This paper contains 3 questions. All questions are compulsory, subject to instruction provided against each question. All workings must form part of your answer. Assumptions, if any, must be clearly indicted.

Question No. 1 : Answer all questions. [20 marks]

1. (a) Define the term 'Specification.' [2]
(b) What is Operation Process Chart? [2]
(c) A steel plant has a design capacity of 25,000 tons of steel per day, effective capacity of 20,000 tons of steel per day and an actual output of 18,000 tons of steel per day. Compute the efficiency of the plant and its utilization. [2]
(d) Define Partial Productivity. [2]
(e) What do you mean by the term Reliability Improvement? [2]
(f) Define Expert System. [2]
(g) List the disadvantages of coding. [2]
(h) Name big five of ERP market. [2]
(i) Define Database Administrator (DBA). [2]
(j) Define the term Commerce Net. [2]

Answer:

(a) A Specification is a detailed description of a material, part or product, including physical measures such as dimensions, volume, weight etc. These physical measure are given tolerances (acceptable variations). Tolerances are stated minimum and maximum for each dimension of a product. Tight tolerances facilitate interchangeability of parts and allows ease of assembly and effective functioning of the finished products.

(b) The basic process chart, called an operation process chart, is understood as a graphic representation of the points at which the materials are introduced into the process and the sequence of inspections and all operations except those involved in materials handling. It includes information considered desirable for analysis such as time required to carry out the operation and the location.

(c) Efficiency of the plant = Actual output/ Effective Capacity
= (18,000 /20,000) x100 =90%

Utilization = Actual Output/Design Capacity
= (18,000/25,000) x 100 = 72%

(d) Partial Productivity: This measures productivity of one factor or input, keeping other factors or inputs constant or unchanged. Mathematically, this is a partial derivative of the output with respect to one input, keeping the other inputs constant.

(e) If an equipment system has a reliability which needs further improvement, how should the reliabilities of the various components be increased in order to get the desired improvement in the reliability of the equipment system.

(f) An Expert system is a knowledge based system which acts an expert in devising solutions.
An expert system acts in a specific area only with the support of knowledge database on this specific area. Knowledge data base means structured information stored on previous solution sets in unstructured problem situations. In other words, an expert system operates on previous experience which is stored in a database. Even the present solution devised from the system and the information on its outcome will also be stored.

(g) Coding also has some negative effects:
• Information is coarsened by forcing it all into categories – there might not be a category that matches what you want to record – e.g. hair colour
• The same can be true of rounding numbers – the intervals or numbers of categories is called the granularity – this needs to be chosen carefully to maintain the quality of the information.

(h) ERP market during 1990, was dominated by few vendors namely SAP, BaaN, Oracle, People Soft and JD Edwards, who were also known as big five of ERP market. Key focus of ERP vendors, during that period, was to expand functional scope of their product and provide sharper vertical focus.

(i) The DBA is responsible for authorizing access to the database, for coordinating and monitoring its use, and for acquiring software and hardware resources as needed. The DBA is accountable for problems such as breach of security or poor system response time.

(j) 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 with the aim of creating infrastructure for business-to –business transactions on the internet.

Operation Management

Answer any three questions

2. (a) (i) A plant manager is considering replacement policy for a new machine. He estimates the following costs. (All costs in ₹ 000)

Year	1	2	3	4	5	6
Replacement cost at beginning of year	100	110	125	140	160	190
Salvage value at end of year	60	50	40	25	10	0
Operating costs	25	30	40	50	65	80

Find an optimal replacement policy and corresponding minimum cost. [6]

(ii) Define Degeneracy in a simplex LPP. How is it resolved? [5]

(iii) Write a note on Concept Testing. **[5]**

(b) (i) List the various steps in Work Measurement. **[6]**

(ii) Contribution per unit (₹)

	WH 1	WH 2	WH 3	WH 4	Total supplies
Plant I	48	60	56	58	14
Plant 2	40	55	53	60	26
Plant 3	50	100	60	62	36
Total Demand	20	32	25	21	

Find the initial solution by North-West Corner method. Is the initial solution feasible? **[10]**

(c) (i) State Deming's 14 points for Quality Management. **[7]**

(ii) The ARB Company is planning to design, develop and market a new racing cycle. The project is composed of the following activities:

Activity	Description	Predecessors	Time (weeks)
A	Design frame	-	4
B	Design wheels	-	3
C	Design gears	-	3
D	Design handle bars	C	2
E	Test steering	A,B,D	1
F	Test gears	A,B,D	2
G	Performance test	E,F	3
H	Manufacturing layout	A,B,D	3
I	Manufacturing demonstration	H	5
J	Preparing advertising	G	2
K	Preparing users manual	G	4
L	Distribute to dealers	I,J,K	2

Draw the network; find critical path and total duration of project. **[9]**

(d) (i) After observing heavy congestion of customers over a period of time in a petrol station, Mr. Ustad has decided to set up a petrol pump facility on his own in his near by site. He has complied statistics relating to the potential customer arrival pattern and service pattern as given below. He has also decided to evaluate the operations by using the simulation technique.

Arrivals		Services	
Inter-arrival time (minutes)	Probability	Inter-arrival time (minutes)	Probability
2	0.22	4	0.28
4	0.30	6	0.40
6	0.24	8	0.22

8	0.14	10	0.10
10	0.10		

Assume:

(i) The clock starts at 8.00 hours

(ii) Only one pump is set-up

(iii) The following 12 Random Nos. are to be used to depict the customer arrival pattern

78	26	94	08	46	63	18	35	59	12	97	82

(iv) The following 12 Random Nos. are to be used to depict the service pattern

44	21	73	96	63	35	57	31	84	24	05	37

You are required to find out the

(i) Probability of the pump being idle

(ii) Average time spent by a customer waiting in queue. **[12]**

(ii) Define "Plant Shut Down"? Under what situations will you advise to resort to plant shut down? **[4]**

Answer:

(a)

(i)

Year(n)	Operating Cost M(t)	Cumulative operating cost ∑M(t)	Replacement cost at beginning of year (C)	Salvage value at end of year S(t)	Depreciation C-S(t)	Total Cost TC_n	Average Cost ATC_n
(1)	(2)	(3)	(4)	(5)	(6)=(4-5)	(7)=(3+6)	(8)=(7/1)
1	25	25	100	60	40	65	65
2	30	55	110	50	60	115	57.5
3	40	95	125	40	85	180	60
4	50	145	140	25	115	260	65
5	65	210	160	10	150	360	72
6	80	290	190	0	190	480	76.7

Since the average total cost per year is minimum in the second year, the machine should be replaced after 2 years and the corresponding minimum annual cost of replacement is ₹57500.

(ii) The concept of obtaining a degenerate basic feasible solution in a LPP is known as Degeneracy. The degeneracy in a LPP may arise

(i) At the initial stage when at least one basic variable is zero in the initial basic feasible solution.

(ii) At any subsequent iteration when more than one basic variable is eligible to leave the basic and hence one or more variables becoming zero in the next iteration and the problem is said to degenerate. There is no assurance that the value of the objective function will improve, since the new solutions may remain degenerate. As a result, it is

possible to repeat the same sequence of simplex iterations endlessly without improving the solutions. This concept is known as cycling or circling.

Degeneracy is solved by the following procedure:

(i) Divide each element in the tied rows by the positive coefficients of the key column in that row.

(ii) Compare the resulting ratios, column by column, first in the identity and then in the body, from left to right.

(iii) The row which first contains the smallest algebraic ratio contains the leaving variable.

(iii) This is concerned with measuring customer reactions to the idea or concept of a product. In fact, it is a kind of research in which the product idea is screened before any money, time or labour are committed to making the prototype products. The idea of a product with as many details as possible is made known to the customers either verbally or through the use of suitable blueprints. The response of the customers is checked and only if it is found encouraging then the development of product prototype is taken up. For instance, when the_ rest of the world had largely gone in for synthetic detergent in the powder form, it was decided by the Hindustan Lever Limited to test a *detergent bar* as a concept, because in India most people do not use washing machines or even buckets and are accustomed to using a bar to rub on the fabric.

The concept testing can tell whether the product is likely to be a future success or not. To achieve better results, however, the product concept should include the finished product itself, with all details, *viz.,* packaging, price category, the brand name, etc. On the basis of these details interviews are conducted to collect the opinion of the would be purchasers.

The major advantage of concept testing is that the management could form early judgments on the likelihood of the market success of the new ideas. The other objectives of concept testing could be:

To evaluate the relative merits of several new product proposals,

To determine whether the product idea is to be abandoned or modified,

To determine the size of the potential market,

To guide the management to adopt suitable marketing policies in advance.

Concept testing has the following limitations or drawbacks:

It entails some risk of disclosing the company plans to competitors.

There is a time-lag for obtaining and assessing the results.

Respondents may overstate their interest and encourage unsound development.

The validity of any measure of potential market size obtained through early stage concept testing is often dubious.

Findings may be misleading if the test is not carried out properly.

(b) (i) The various steps in Work Measurement are:

- Break The job into elements
- Record the observed time for each element by means of either time study , synthesis or analytical estimating.
- Establish elemental time values by extending observed time into normal time for each element by applying a rating factor.
- Assess relaxation allowance for personal needs and physical and mental fatigue involved in carrying out each element.
- Add the relaxation allowance time to the normal time for each element to arrive at the work content.

- Determine the frequency of occurrences of each element in the job, multiply the work content of each element by its frequency (i.e. number of time the element occurs in the job) and add up the times to arrive at the work content for the job.
- Add contingency allowance if any to arrive at the standard time to do the job.

(ii) Total demand is 98. Total supply is 76. We introduce dummy plant with supply as 22 and contribution per unit to be zero

Contribution per unit (₹)

	WH 1	**WH 2**	**WH 3**	**WH 4**	**Total supplies**
Plant 1	48	60	56	58	14
Plant 2	40	55	53	60	26
Plant 3	50	100	60	62	36
Dummy Plant	0	0	0	0	22
Total Demand	20	32	25	21	98

Opportunity Loss Matrix

	WH 1	**WH 2**	**WH 3**	**WH 4**	**Total supplies**
Plant 1	(14)				14
Plant 2	(6)	(20)			26
Plant 3		(12)	(24)		36
Dummy Plant			(1)	(21)	22
Total Demand	20	32	25	21	98

Initial Solution

From	**Plant 1**	**Plant 2**	**Plant 2**	**Plant 3**	**Plant 3**	**Plant 4**	**Plant 4**
To	WH 1	WH 1	WH2	WH2	WH3	WH3	WH4
Units	14	6	20	12	24	Dummy	Dummy
Feasibility test	m + n -1 =7		No. of allocations = 7		The solution is **feasible**		

(c) (i) Deming's 14 points for quality Management

(i) Create constancy of purpose for continual improvement of product/services.

(ii) Adopt the new policy for economic stability.

(iii) Cease dependency on inspection to achieve quality.

(iv) End the practice of awarding business on price tag alone.

(v) Improve constantly and forever the system of production and service.

(vi) Institute training on the job.

(vii) Adopt and institute modern method of supervision and leadership.

(viii) Drive out fear. (Fear of failure, fear of change etc).

(ix) Breakdown barriers between departments and individuals.

(x) Eliminate the use of slogans, posters and exhortations.

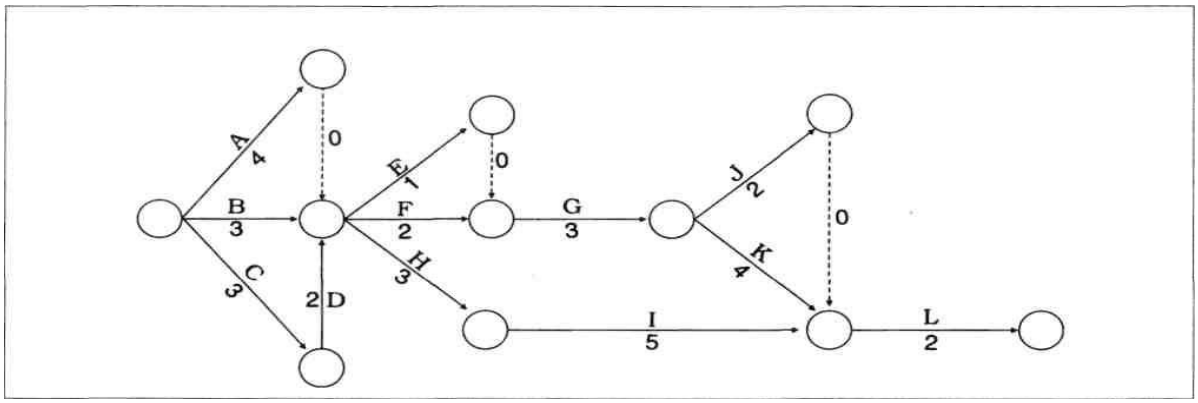
(xi) Eliminate work standards and numerical quotas.

(xii) Remove barriers that rob the hourly worker of the right to pride in workmanship.

(xiii) Institute a vigorous program of education and retraining.

(xiv) Define top management's permanent commitment to ever improving quality and productivity.

(ii)



Paths	Duration	Paths	Duration
AEGJL	4+1+3+2+2=12	CDFGKL	3+2+2+3+4+2=16
AEGKL	4+1+3+4+2=14		Critical path
BEGJL	3+1+3+2+2=11	CDFGJL	3+2+2+3+2+2=14
BEGKL	3+1+3+4+2=13	CDEGJL	3+2+1+3+2+2=13
BFGJL	3+2+3+2+2=12	CDHIL	3+2+3+5+2=15
BFGKL	3+2+3+4+2=14	CDEGKL	3+2+1+3+4+2=15

(d) (i)

Inter-arrival time				**Service time**			
Inter-	**Probability**	**Cumulative**	**Range**	**Inter-arrival**	**Probability**	**Cumulative**	**Range**

arrival time (minutes)		probability		time (minutes)		probability	
2	0.22	0.22	00-21	4	0.28	0.28	00-27
4	0.30	0.52	22-51	6	0.40	0.68	28-67
6	0.24	0.76	52-75	8	0.22	0.90	68-89
8	0.14	0.90	76-89	10	0.10	1.00	90-99
10	0.10	1.00	90-99				

Sl.no	Random No. for inter-arrival	Inter-arrival time	Entry time in queue	Service start time	Random no. for service	Service time	Service end time	Waiting time of customer	Idle time
1	78	8	8.08	8.08	44	6	8.14	-	8
2	26	4	8.12	8.14	21	4	8.18	2	-
3	94	10	8.22	8.22	73	8	8.30	-	4
4	08	2	8.24	8.30	96	10	8.40	6	
5	46	4	8.28	8.40	63	6	8.46	12	
6	63	6	8.34	8.46	35	6	8.52	12	
7	18	2	8.36	8.52	57	6	8.58	16	
8	35	4	8.40	8.58	31	6	9.04	18	
9	59	6	8.46	9.04	84	8	9.12	18	
10	12	2	8.48	9.12	24	4	9.16	24	
11	97	10	8.58	9.16	05	4	9.20	18	
12	82	8	9.06	9.20	37	6	9.26	14	
Total Validity Time								140	12

Average waiting time spent by the customer= 140/12= 11.67 minutes.
Probability of idle time of the petrol station= 12/86= 0.1395 or 13.95% idle, say 14%.

(ii) 'Plant shutdown' means total stoppage of plant and production activities by cutting off in-coming power supply to the plant. Plant shutdown is resorted to under the following conditions :

(i) At the time of puja holidays for doing preventive and major overhauling jobs.
(ii) Due to unusual situations.
(iii) At the time of recession when demands fall considerably.
(iv) When prices are less than total cost.
(v) For minor repair of generators, transformers, etc., after the normal working hours.

Information System

Answer any two questions.

3. (a) (i) List the advantages of Prototyping Model. [6]
(ii) Write a note on case tools. [5]
(iii) Define RDBMS and name two commonly used RDBMS. [5]

(b) (i) List the critical factors for failure of Enterprise Resource Planning. [6]

(ii) State the effects of applying computer technology to Information System. [7]
(iii) Define Programmed decision making. [3]

(c) (i) Discuss the components of Electronic Data Interchange (EDI). [6]
(ii) Describe Digital Signature Certificate. [6]
(iii) Describe Section 7 of the Information Technology Act, 2008. [4]

Answer:

(a) (i) Advantages of Prototyping Model are :

- It provides quick implementation of an incomplete, but functional, application.
- Prototyping requires intensive involvement by the system users.
- A very short time period is normally required to develop and start experimenting with prototype.
- Since system users experiment with each version of the prototype through an interactive process, errors are hopefully detected and eliminated early in the developmental process.
- It reduces the cost of user training.
- It improves the fact finding process.
- It helps to identify confusing or difficult functions and missing functionality.
- Prototyping model encourages innovation and flexible designs.

(ii)

Case Tools: CASE (Computer-Aided-Software Engineering) refers to the automation of anything that humans do to develop systems and support virtually all phases of traditional system development process. These can be used to create internally requirements specifications with graphic generators and using of specifications languages. The various CASE tools are menu generator, screen generator, report generator and code generator.

- Layout form and Screen Generator: They are for printed report used to format or paint the desired layouts.
- Menu Generator: Menu generator outlines the functions.
- Report Generator: It indicate totals, paging, sequencing and control breaks in creating samples of the desired report.
- Code Generator: It allows the analyst to generate modular units of source code.

Some of the other features that various CASE products possess are - Repository / Data Dictionary, Computer aided Diagramming Tools; Word Processing; Screen and Reverse Engineering.

(iii) In Relational Database Structures, records are stored in the form of two dimensional tables. The table is a file, in which each row represents one record and each column represents a field. In this database structure, relationships between the records need not to be specified in advance. Relational databases provide the flexibility in performing database queries and creating reports from more than one file by establishing the relationship among them on the basis of primary key. This relationship among the files can be created at any time according to the requirement and need not to be specified at the time of creation of database files.

The relational database structure is more flexible than hierarchical or network database structures in providing answers of adhoc reports but it does not process the large batch applications with the speed of hierarchical or network databases.
Examples of Relational Database Management Systems include Oracle, IBM DB2 SQL Server, MS-Access etc.

(b) (i) Some specific concerns of failures are mentioned below:

• Creeping in of additional functionality: Pressure often mounts for additional functionalities not envisaged earlier during implementation. This may lead to conflict with ERP vendor. Dealing through change management process also involves additional cost and time and should be avoided as far as possible.

• Unrealistic expectations: ERP system is not an all cure silver bullet. Users often like to see an immediate improvement after installation. There are bound to be initial period of frustration which may snowball, undermining confidence on the system.

• Information overload: An ERP system contains hundreds of reports and queries. Too much information creates a lot of confusion amongst users. Notwithstanding information overload, many a time, users feel cheated as the system fail to generate identical reports to which they are accustomed.

• Resistance to Change: Users are overwhelmed by all the new features of the system. Some of the aged employees may be unwilling to adopt a new way of working. Some may be uncomfortable with the awareness that their supervisor will now keep a better trail on what they are doing.

(ii) The effects of applying computer technology to Information System are as discussed below:

(a) Increase in speed of processing and retrieval of data: Computer with its fast computational capability and systematic storage of information with random access facility has emerged as an answer to the problems faced in modern days management.

(b) Expansion in the scope of use of information system: System experts in business organizations developed the areas and functions, where computerized MIS could be used to improve the working of the concern. These types of applications are not feasible under the manual system.

(c) Scope of analysis widened: The use of computer can provide multiple type of information accurately and which makes the decision fast.

(d) Complexity of system design and operation increased: The computer manufacturers have developed some important programs software to help the users, which are self explanatory and require minimum system experts.

(e) Integrates the working of different information subsystem: There are number of subsystems like production, material, marketing ,finance, engineering and personnel which are integrated only due to applying computer technology to MIS.

(f) Increases the effectiveness of information systems: Before the existence of computer technology, it was difficult to provide the relevant information to business executives in time even after incurring huge expenses. The use of computer technology has overcome this problem, by providing timely, accurate and desired information for the purpose of decision-making.

(g) More comprehensive information: The use of computer for MIS enabled system expert to provide more comprehensive information to executives on business matters.

(iii) Programmed decision making refers to those decision making process which are based on some standard set of procedure established by the management and according to

scientific principle of management. In case of programmed decision making, supporting information sets and reports are standard, well defined and well structured. Naturally decision making process is simple and based on some guidelines. For example, stores ledger summary and material consumption reports may help in decision making on Inventory control.

(c) (i) EDI consists of three components:

- Communication - To make EDI work, one needs communication software, translation software and access to standards. Communication software moves data from one point to another, flags the start and end of the document. Translation software helps the user to build a map and shows him how the data fields from his application corresponds to the elements of EDI standards. It also converts data back and forth between the application format and the EDI format.
- Mapping - To build a map, the user first selects the EDI standard for the kind of data he wants to transmit. Usually the trading partner tells about the kind of standards to be used. Next, he edits out parts of the standards, which do not apply, to his application. Next, he imports a file that defines the fields in his application, and finally he makes the map to show where the data required by the EDI standards is located in his application. Once the map is built, the translator will refer to it during EDI processing every time a transaction of that type is sent or received.
- Profile - The last step is to write a partner profile that tells the system where to send each transaction and how to handle errors or exceptions. Whereas the user needs a unique map for every kind of documents he exchanges with a partner, he should only have to define partner information once.

(ii) A digital signature certificate is a mechanism for authenticating and securing the information that is transmitted between the two parties. It is an authoritative identification about a person or a company. It is simply a public key along with some identifying information., that has been digitally signed by a certificate authority. It identifies the subscriber, certification authority, and its operational period and contains the subscriber public key. The certificate is thus protected so that it cannot be altered without detection. It is like an electronic passport that authenticates identity of an entity. The identifying information in the certificate can be trusted because the digital signature is cryptically strong.

Legal recognition of digital signature, electronic records and authentication is necessary in an electronically formed contract. The Information Technology Act provides legal status on the use of the electronic records and signatures. Authentication and non-repudiation are secured through the mechanism of digital signature. The digital signature certificate ensures that the purported sender is in fact the person who sent the message.By certifying that a particular public key does indeed belong to a specific person, it authenticates and makes digital signature conclusive. For verification of such signature, the verifier must have the signer's public key and have an assurance that it corresponds to his private key. Digital certificate associates a particular person to that pair. Its basic purpose is to serve the need of the person seeking to verify a digital signature who would want to know that:

- The public key corresponds to the private key used to create the digital signature
- Whether the public key is identified with the signer.

Section 35 of the Act deals with the issue of the digital certificate by the Certifying Authority, on an application being made in the prescribed form.

(iii) Section 7 of the Information Technology Act,2008 provides that the documents, records or information which is to be retained for any specified period shall be deemed to have retained if the same is retained in the electronic form provided the following conditions are satisfied:

- The information therein remains accessible so as to be usable subsequently.
- The electronic record is retained in its original format or in a format which accurately represents the information contained.
- The details which will facilitate the identification of the origin, destination, dates and time of dispatch or receipt of such electronic record are available therein.

This section does not apply to any information which is automatically generated solely for the purpose of enabling an electronic record to be dispatched or received.

Moreover, this section does not apply to any law that expressly provides for the retention of documents, records or information in the form of electronic records.