Answer to MTP_Intermediate_Syllabus 2008_Jun2015_Set 1

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) Fill in the blanks given below: **[1 x 4 =4]**

(i) ---------- is the interval between placing an order for a particular item and its actual receipt.
(ii) ---------- Conveyors are used for loading cement into bags in a Cement Plant.
(iii) Product is a combination of potential utilities for a ----------.
(iv) Statistical analysis is used to determine the optimum policy of ---------- maintenance.

(b) Expand the following abbreviations: **[1 x 5 =5]**

(i) CRM
(ii) PDCA
(iii) COPQ
(iv) EMQ
(v) LTPD

(c) State whether following statements are true or false: **[1 x 5 =5]**

(i) Technological obsolescence is major danger which business firms face in modern era.
(ii) Quality of lot submitted for inspection is the percentage of defectives actually present in it.
(iii) The concept of quality circle is primarily based upon recognition of the value of the worker.
(iv) Quality of lot submitted for inspection is the percentage of defectives actually present in it.
(v) Factor Comparison is a method of Job Evaluation.

Answer:

(a) (i) Time log
(ii) Pneumatic
(iii) Product layout
(iv) Preventive

(b) (i) Customer Relationship Management
(ii) Plan-Do-Check-Act
(iii) Cost of Poor Quality
(iv) Economic Manufacturing Quantity
(v) Lot Tolerance Percentage Defective

(c) (i) True. Technological obsolescence is major danger which business firms face in modern era.

(ii) False. Quality of lot submitted for inspection provides the details of defectives actually present in it.

(iii) True. The concept of quality circle is primarily based upon recognition of the value of the worker.

(iv) False. Quality of lot submitted for inspection provides the details of defectives actually present in it.

(v) True. Factor Comparison is a method of Job Evaluation.

2. (i) A Hospital has to pay nurses for 40 hours a week. One nurse is assigned to one patient. The cost per hour for each of the nurses is given below:

Patient →	W	X	Y
Nurse ↓			
K	10	10	30
L	30	10	20
M	20	30	20

(i) Find the nurse patient combination to minimize cost to the hospital.

(ii) How much does each nurse earn per week?

Suppose that a new patient Z is admitted and that a new nurse is appointed. The new patient is charged ₹40 per hour by each of the existing nurses. The new nurse charges ₹50 per hour irrespective of the patient.

(iii) What would be your revised calculations?

(iv) Comment on the new solution. [12]

(ii) The annual sale of ceiling fans by a dealer in Punjab are as under:

Year	2011	2012	2013	2014	2015
Sales (thousand units)	3	14	36	4	33

Fit a linear trend equation to the sales figure and estimate the sales for the year 2016. [6]

Answer:

(i) (i) and (ii)

Row operations

Patient →	W	X	Y
Nurse ↓			
K	00	00	20
L	20	00	10
M	00	10	00

Columns operation is not required as there is zero in each column.

Minimum number of lines.

Patient →	W	X	Y
Nurse ↓			
K	00	00	20
L	20	00	10
M	00	10	00

As the minimum number of lines are equal to order of matrix, optimal assignment should be made.

Optimal Assignment

Patient →	W	X	Y
Nurse ↓			
K	00	00	20
L	20	00	10
M	00	10	00

Assignment:	Cost	Earnings of nurses
Nurse K → Patient W	Patient W ₹10 × 40 = ₹400	Nurse K ₹10 × 40 = ₹400
Nurse L → Patient X	Patient X ₹10 × 40 = ₹400	Nurse L ₹ 10 × 40 = ₹400
Nurse M → Patient Y	Patient Y ₹20 × 40 = ₹800	Nurse M ₹ 20 × 40 = ₹800
	Total ₹1600	Total ₹1600

(iii) New Scenario

Patient →	W	X	Y	Z
Nurse ↓				
K	10	10	30	40
L	30	10	20	40
M	20	30	20	40
New Nurse	50	50	50	50

Row reduction

Patient →	W	X	Y	Z
Nurse ↓				
K	00	00	20	30
L	20	00	10	30
M	00	10	00	20
New Nurse	00	00	00	00

As there is zero in each column, column reduction is not required.
Minimum number of lines:

Patient →	W	X	Y	Z
Nurse ↓				
K	00	00	20	30
L	20	00	10	30
M	00	10	00	20
New Nurse	00	00	00	00

As the minimum number of lines are equal to order of matrix, optimal assignment should be made.

Patient →	W	X	Y	Z
Nurse ↓				
K	00	00	20	30
L	20	00	10	30
M	00	10	00	20
New Nurse	00	00	00	00

Assignment:	Cost	Earnings of nurses
Nurse K → Patient W	Patient W ₹10 × 40 = ₹400	Nurse K ₹10 × 40 = ₹400
Nurse L → Patient X	Patient X ₹10 × 40 = ₹400	Nurse L ₹ 10 × 40 = ₹400
Nurse M → Patient Y	Patient Y ₹20 × 40 = ₹800	Nurse M ₹ 20 × 40 = ₹800
New → Patient Z	Patient Z ₹ 50 × 40 = ₹2,000	New ₹50 × 40 = ₹2,000
	Total ₹3600	Total ₹3600

(iv) The new nurse's charge for the existing patients amounts to ₹40 per hour which is higher than those of existing nurses. Hence, new nurse won't be assigned to existing patient's. As there is no change in the assignments of existing nurses and existing patients, we may not redo the problem. We simply assign new nurse to the new patient.

(ii)

Year	Time deviation from 2012 (X)	Sales('000 units) (Y)	Square of Time deviation (X^2)	Product of time deviation & sales (XY)
2011	-2	3	4	-6
2012	-1	14	1	-14
2013	0	36	0	0
2014	+1	4	1	4
2015	+2	33	4	66
n=5	$\sum X = 0$	$\sum Y = 90$	$\sum X^2 = 10$	$\sum XY = +50$

Regression equation of Y on X

$Y = a + bX$

$a = \frac{\sum Y}{n} = \frac{90}{5} = 18$

$b = \frac{\sum XY}{\sum X^2} = \frac{50}{10} = 5$

$Y = 18 + 5X$

$Y_{2016} = 18 + 5(3) = 18 + 15 = 33$ i.e. 33000 units of ceiling fans.

3. (i) State the advantages of KAIZEN Technique. [5]

(ii) Draw the network for the following activities and find critical path and total duration of project:

Activity	Duration (days)	Activity	Duration (days)
1-2	**34**	**2-5**	**37**
1-3	**27**	**2-6**	**18**
1-4	**41**	**3-5**	**10**
2-3	**38**	**3-6**	**16**
2-4	**85**	**4-5**	**19**

[10]

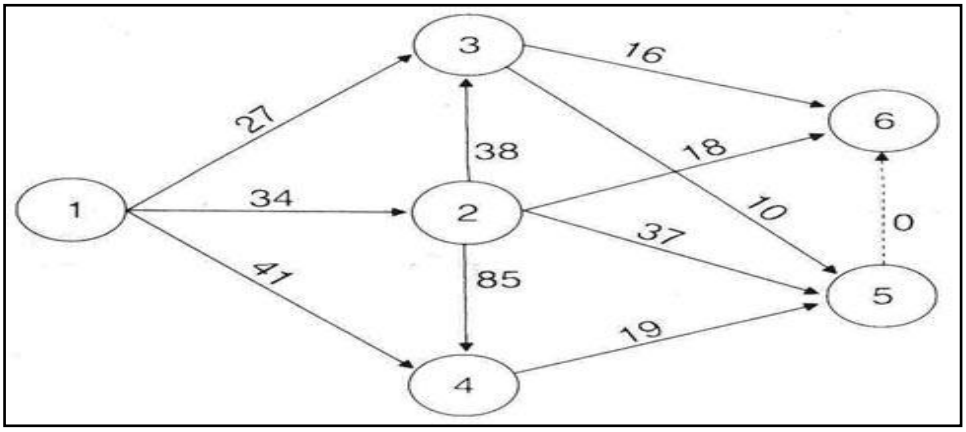
(iii) Differentiate between Jigs and Fixtures. **[3]**

Answer:

(i) The KAIZEN gives freedom to the employees. It does not specify what changes are to be made or how many of them are to be made. Improvements can be in any discipline and in any field of human activity related to the productivity. These decisions are left to the individuals. This leads to obvious advantages as follows:

- The first and foremost benefit of KAIZEN is that it brings about attitudinal changes among employees towards improvements of their routine work. Hence, it increases the productivity and a new work culture is created in the organization.
- Once the culture is transformed, the way gets cleared for introducing other productivity improvement systems like JIT, KABAN etc. obviously leading to productivity improvement.
- KAIZEN system reduces resistance to change.
- Ownership of work improves in KAIZEN environment. It is the inner voice of the employees that drives them to make the improvements, rather than the orders given down through the hierarchy.

(ii)



Paths	Duration	Paths	Duration
1-2-3-5-6	34+38+10+0=82	1-2-4-5-6	34+85+19+0=138 (Critical Path)
1-2-3-6	34+38+16=88	1-3-6	37+16=43
1-2-5-6	34+37+0=71	1-3-5-6	27+10+0=37
1-2-6	34+18=52	1-4-5-6	41+19+0=60

(iii) A fixture is usually large and permanently attached to the work surface, and its function is to hold the material being worked with in place. A fixture is also constructed to fit a specific shape or part, so it cannot be universally used with any project. A jig stabilizes the material in similar manner to a fixture but differs in that it also guides the material during the manufacturing process to ensure accurate, reliable results. Like a fixture, a jig is also created for specific applications, but it is not directly affixed to the work surface. It is thus more mobile and can be used in different location.

4. (i) A car manufacturing company manufactures 80 cars per day. The sale of cars depends upon the demand which has the following distribution.

Sale of cars	77	78	79	80	81	82
Probability	0.10	0.15	0.20	0.35	0.15	0.05

The production cost and sale price of each car are ₹4 lakhs and ₹5 lakhs respectively. Any unsold car is to be disposed of at a loss of ₹2 lakhs. There is penalty of ₹1 lakh per car, if the demand is not met. Using the following random numbers, estimate the total profit/loss for the next 10 days:

09	98	64	98	94	01	78	10	15	19

If the company decides to produce 79 cars per day, what will be its impact on profitability? [12]

(ii) A company has two grades of inspectors, 1 and 2 to undertake quality control inspection. At least 3,500 pieces must be inspected in an 8 hour day. Grade 1 inspector can check 50 pieces in an hour with an accuracy of 95%. Grade 2 inspector checks 25 pieces an hour with an accuracy of 90%.

The daily wages of grade 1 inspectors are ₹6 per hours while those of grade 2 inspectors are ₹5 per hour. Any error made by an inspector cost ₹4 to the company. If there are, in all, 20 grade 1 inspectors and 25 grade 2 inspectors in the company, find the optimal assignment of inspectors that minimizes the daily6 inspection cost. Formulate the LPP. [6]

Answer:

(i) Profitability Distribution (Demand)

Demand	Probability	Cum. Prob.	Range	Range for simulation
77	0.10	0.10	0 - 0.10	0 - 0.09
78	0.15	0.25	0.10 - 0.25	0.10 - 0.24
79	0.20	0.45	0.25 - 0.45	0.25 - 0.44
80	0.35	0.80	0.45 – 0.80	0.45 – 0.79
81	0.15	0.95	0.80 – 0.95	0.80 – 0.94
82	0.05	1.00	0.95 – 1.00	0.95 – 0.99

Production 80 cars per day

Day	Demand	Regular Sale (I)	Sale of unsold cars (II)	Cost (III)	Penalty (IV)	Profit/Loss (I+II-III-IV)
1	77	₹385L	₹6L	₹320L	-	₹71L
2	82	₹400L	-	₹320L	₹2L	₹78L
3	80	₹400L	-	₹320L	-	₹80L
4	82	₹400L	-	₹320L	₹2L	₹78L
5	81	₹400L	-	₹320L	₹1L	₹79L
6	77	₹385L	₹6L	₹320L	-	₹71L
7	80	₹400L	-	₹320L	-	₹80L
8	78	₹390L	₹4L	₹320L	-	₹74L
9	78	₹390L	₹4L	₹320L	-	₹74L
10	78	₹390L	₹4L	₹320L	-	₹74L
Total						₹759L

Production 79 cars per day

Day	Demand	Regular Sale (I)	Sale of unsold cars (II)	Cost (III)	Penalty (IV)	Profit/Loss (I+II-III-IV)
1	77	₹385L	₹4L	₹316L	-	₹73L
2	82	₹395L	-	₹316L	₹3L	₹76L
3	80	₹395L	-	₹316L	₹1L	₹78L
4	82	₹395L	-	₹316L	₹3L	₹76L
5	81	₹395L	-	₹316L	₹2L	₹77L
6	77	₹385L	₹4L	₹316L	-	₹73L
7	80	₹395L	-	₹316L	₹1L	₹78L
8	78	₹390L	₹2L	₹316L	-	₹76L
9	78	₹390L	₹2L	₹316L	-	₹76L
10	78	₹390L	₹2L	₹316L	-	₹76L
Total						₹759L

There is no change in profit if production changes from 80 units/day to 79 units/day.

(ii) Let x_1 and x_2 be the number of grade 1 and 2 inspectors respectively to be assigned by the company for daily inspection.

Now the company has to incur two types of costs, wages paid to the inspectors and the cost of their inspection errors. The inspection costs of grade 1 inspector per hour is : (₹6 +₹4 × 0.05 × 50)= ₹16

Similarly, cost of grade 2 inspector per hour is : (₹5 +₹4 × 0.10 × 25) = ₹15

The above inspection problem can now be formulated in an approximate mathematical form as follows:

Minimize daily inspection cost $Z= 8(16 x_1 + 15 x_2)= 128 x_1 + 120 x_2$

Subject to constraints:

$(50 \times 8 x_1) + (25 \times 8 x_2) \geq 3500$ (Inspection pieces)

$x_1 \leq 20$ (grade 1 inspectors)

$x_2 \leq 25$ (grade 2 inspectors)

$x_1 \geq 0, \quad x_2 \geq 0$

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 5 =5]

(i) Decryption is the reverse process to convert the --------- form of text into readable text.

(ii) The basic aim of ---------- in data structure is to eliminate redundancy and inconsistent dependency.

(iii) Check digit is to ensure --------- of code.

(iv) A record is identified by its ----------.

(v) -------- is a process of assessing risk and reducing it to an acceptable level.

(b) Expand the following abbreviations: [1 x 5 =5]

(i) BASIC

(ii) HLL

(iii) ISAM

(iv) ORDBMS

(v) SET

(c) State whether following statements are true or false: [1 x 4 =4]

(i) Hybrid test is also known as sandwich testing.

(ii) Transaction files are basically intermediate files created during processing for application area.

(iii) ERP bridges the information gap across the organization.

(iv) Data mart has no relevance to Data Warehousing.

Answer:

5. (a) (i) scrambled
(ii) normalisation
(iii) correctness
(iv) key field
(v) risk management

(b) (i) Beginner's All-Purpose Symbolic Instruction Code
(ii) High Level Language
(iii) Indexed Sequential Access Method
(iv) Object Relational Database Management System
(v) Secure Electronic Transaction

(c) (i) True. Hybrid test is also known as sandwich testing.
(ii) False. Work files are basically intermediate files created during processing for application area.
(iii) True. ERP bridges the information gap across the organization.
(iv) False. Data mart is the simple form of data warehousing.

6. (i) Explain the different testing methods employed in a software development. [8]

(ii) "Debugging consists of four steps" – List the steps. [3]

(iii) State the functions of query compiler. [2]

(iv) State the two principal methods of using computers as audit tools. [5]

Answer:

(i) Testing includes both the testing of individual programs and the testing of whole system as an operating entity. Faults not found during testing will reveal themselves more expensively later in the operation. Therefore the testing must be comprehensive. Testing can be broken down into four basic stages.

- Unit Testing [test the logic]-The technique of dry running can be used to make sure that the logic that has been set down by the analyst is correct.The programmer or analyst will trace by hand the progress of a number of sets of data through the structure diagrams or program flow charts. If all data procedures the results that are expected, the individual programs can be written. The individual program will also be tested 'live' with test data in isolation from other program.
- Integration testing [Test each program with data] – Each program is thoroughly tested with test data as above and also tested with several other related programs.
- System testing [test system as a whole]- Once it has been established that individual and groups of programs are working correctly ,the system must be tested as a whole. This is an equally important task and the results should be documented in the same way as those for the testing of programs. It is not only the software that is evaluated during the system testing process, it is also important to test operating procedures, staffing levels etc.
- In this stage users are involved to ensure that the system is usable for them. Users ensure that the system performs its specifications. Testing can be carried out in static or dynamic environment.

(ii) 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.

(a) Inputting the source program to the compiler.

(b) Letting the compiler find errors in the program.

(c) Correcting lines of code that are erroneous.

(d) Resubmitting the corrected source program as input to the compiler.

(iii) 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.

(iv) Two principal methods of using computers as audit tools are:

Test Deck which is made up of dummy transaction data containing both valid and invalid conditions. These are used to test the effectiveness of programmed controls. The test deck can either be created by the auditor himself on the basis of review carried out or procured from reputed vendors marketing standard package for the purpose. The processed result can then be compared with the predetermined result to ensure that the programmes are working accurately.

Generalised Audit Programmes may be procured from the computer vendors/software companies for using computers in carrying out certain audit tasks e.g.

- Search and retrieve
- Test data generation

- Performing arithmetic operations
- Sorting, merging, matching and comparing
- Copying
- Summarising
- Parallel simulation

7. (i) 'The methodology of implementation of ERP system can be divided into five phases"- Discuss. [7]

(ii) From the following two relations find the Intersection operator and Difference operator.

Relation A

REGN_NO	NAME	OCCUPATION
AB 03	J	SERVICE
AB 04	K	STUDENT
AB 05	S	STUDENT
AB 09	D	SERVICE
AB 11	P	STUDENT

Relation B

REGN_NO	NAME	OCCUPATION
AB 04	K	STUDENT
AB 05	S	STUDENT
AB 11	P	STUDENT
AB 15	G	STUDENT
AB 16	R	STUDENT

[4]

(iii) Describe the effects of using computer for MIS. [7]

Answer:

(i) The methodology of implementation of ERP system can be divided into five phases as under:

- Understanding the problem: An in-depth analysis of business system is undertaken to understand the need for an integrated system in handling data and how to improve the data flow towards better management reporting and effective decision making. The company goes for evaluation of different packages and selects the one which is the perfect fit to the requirement.
- Defining solutions: The gaps in the present system, scope of improvement in the data flow and need for integration for better control are the most important three areas which are critically evaluated to arrive at a solution set. Finally, the outcome of the same is taken into consideration for software. This phase gives solution for data migration process, volume of data and database size, plan for implementation in terms of technical requirements and timeframe.
- Undertaking technical work: The work involved in this phase related to procurement of hardware, configuration of the system, data migration, developing and testing the interfaces, developing the new procedure associated with the system, testing the new system and training the end users.
- Going Live: In this phase, the system is to be finally implemented in new environment with real life data set and to the satisfaction of the end-users. The integration of all the modules is the critical part. The co-ordination among project members for different modules is very essential for smooth and successful implementation.
- Post implementation maintenance: Post-implementation needs a different set roles and skills to solve the problems in an integrated system. Training will never end. New

functionality may be added which will invite different technical problems like enhancement of system, fresh configuration for added integration features. To reap the full benefit of ERP system, there should be arrangement for continuous training of employees and periodical review on how to enhance the advantage from the system.

(ii) The Intersection operator is denoted by A∩B and will be a relation as shown below:

Relation A∩B

REGN_NO	NAME	OCCUPATION
AB 04	K	STUDENT
AB 05	S	STUDENT
AB 11	P	STUDENT

The Difference operator is denoted by A-B and will be a relation as shown below:

Relation A-B

REGN_NO	NAME	OCCUPATION
AB 03	J	SERVICE
AB 09	D	SERVICE

(iii) 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.

8. (i) Describe the duties of Certifying Authority. [5]
(ii) List the main goals of E-commerce. [4]
(iii) Describe the term "Secure System". [2]
(iv) Define Executive Information System and list the special features of an EIS. [4]
(v) List the salient features of a WAN. [3]

Answer:

(i) Duties of Certifying Authority:

1. According to Section 30 of the Information Technology Act, 2000, Certifying Authority shall follow certain procedures in respect of Digital Signatures as given below:
   - Make use of hardware, software and procedures that are secure from intrusion and misuse.
   - Provide a reasonable level of reliability in its services, which are reasonably suited to the performance of intended functions.
   - Adhere to security procedures to ensure that the secrecy and privacy of the digital signatures are assured and
   - Observe such other standards, as specified by the regulation.
2. Every Certifying Authority shall ensure that every person employed by him complies with the provisions of the Act, or rules, regulations or orders made thereunder.
3. A Certifying Authority must display its licence at a conspicuous place of the premises in which it carries on its business. A Certifying Authority whose licence is suspended or revoked shall immediately surrender the license to the Controller.
4. Every Certifying Authority shall display its Digital Signature Certificate, which contains the public key corresponding to the private key used by that Certifying Authority and other relevant facts.

(ii) Main Goals of E-commerce:

It helps in achieving following goals

(i) Reach new markets.
(ii) Create new products or services.
(iii) Build customer loyalty.
(iv) Enrich human capital.
(v) Make the best use of existing and emerging technologies.
(vi) Achieve market leadership and competitive advantage.

(iii) "Secure system" means computer hardware, software and procedure that

- Are reasonably secure from unauthorized access and misuse.
- Provide a reasonable level of reliability and correct operation.
- Are reasonably suited to performing the intended function and
- Adhere to generally accepted security procedures.

(iv) An Executive Information System (EIS) is special type MIS meant for top management of an organization.
According to CIMA
An Executive Information System (EIS) is a set of procedure designed to allow senior managers to gather and evaluate information relating to the organization and its environment.

Following are the special features of an EIS:

- It a specially designed tool to feed executives information need.
- It is an easy - to - use and screen based software.
- It provides the executives the facilities of on-line analysis tools like time series analysis, regression analysis etc.
- It is not limited to internal data only. Access to external sources of data is also provided.
- It provides the facilities to connect to internet.
- Information is presented in summary format.

- It is a comprehensive Information System and work in conjunction with DSS.

(v) Salient features of WAN:

- Large geographical area – It is spread over large geographical area.
- Interconnection – The computers are generally connected to each other through telecommunication channels
- Transfer speed – The data is transmitted at relatively slower speed as that of LAN.
- Control – A public normally holds the control over the data transmission amongst the users.