Answer to MTP_Intermediate_Syllabus 2008_Jun2015_Set 2

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) Match each item in Column I with an appropriate item in Column II: [1 x 10=10]

Column I	Column II
(A) Assembly Line	(i) F.W. Taylor
(B) Scheduling	(ii) Surface Treatment
(C) Fractionalization	(iii) Meredith & Gibbs
(D) Work Study	(iv) Machining
(E) Mortality Curve	(v) Metal Forming
(F) Black Oxidation	(vi) Gilbreth
(G) Counter boring	(vii) Joining
(H) Drawing	(viii) Heat Treatment
(I) Tempering	(ix) Henry Ford
(J) Brazing	(x) Henry Gantt

(b) Expand the following abbreviations: [1 x 4 =4]

(i) WBS
(ii) CWQC
(iii) PDCA
(iv) PG

Answer:

1. (a)

Column I	Column II
(A) Assembly Line	(ix) Henry Ford
(B) Scheduling	(x) Henry Gantt
(C) Fractionalization	(vi) Gilbreth
(D) Work Study	(i) F.W. Taylor
(E) Mortality Curve	(iii) Meredith & Gibbs
(F) Black Oxidation	(ii) Surface Treatment
(G) Counter boring	(iv) Machining

(H) Drawing	(v) Metal Forming
(I) Tempering	(viii) Heat Treatment
(J) Brazing	(vii) Joining

(b) (i) Work Breakdown Structure.
(ii) Company Wide Quality Control
(iii) Plan Do Check Act
(iv) Performance Guarantee

2. (i) ABC Corporative bank receives and disburses different amount of cash in each month. The bank has an opening cash balance of ₹15 Crores in the first month. The pattern of receipts and disbursements from the past data is as follows:

Monthly cash receipts		Monthly cash payments	
₹ Crores	Probability	₹ Crores	Probability
30	0.20	33	0.15
42	0.40	60	0.20
36	0.25	39	0.40
99	0.15	57	0.25

- **Calculate probability that the ABC Cooperative bank will fall short in payments.**
- **Calculate average monthly shortfall.**
- **If the ABC Cooperative Bank can get an overdraft facility of ₹45 Crores from some other bank, what is the probability that they will fall short in monthly payments?**

Use the following sequence of paired random numbers:

17,78	43,16	74,35	31,23	72,44	46,92
51,58	68,08	93,58	54,78	96,54	09,77

[8]

(ii) Draw network. Determine the critical path and duration of the project. Find total float for each activity. (Duration in days)

Activity	1-2	1-3	1-4	2-5	3-6	3-7	4-6	5-8	6-9	7-8	8-9
Duration	2	2	1	4	8	5	3	1	5	4	3

[10]

3. (i) The data on the operating costs per year and resale prices of equipment A whose purchase price is ₹1,00,000 are given here:

Year	1	2	3	4	5	6	7
Operating Cost (₹)	15,000	19,000	23,000	29,000	36,000	45,000	55,000
Resale value (₹)	50,000	25,000	12,500	6,000	4,000	4,000	4,000

(a) What is the optimum period for replacement?

(b) When equipment A is 2 years old, equipment B, which is a new model for the same usage, is available. The optimum period for replacement is 4 years with an average cost of ₹36,000. Should we change equipment A with that of B? If so, when? [12]

(ii) Explain Quality Control and six major objectives of Quality Control. [6]

4. (i) Solve the following Assignment problem. The data given in the table refers to production in units:

	Machines			
Operators	**A**	**B**	**C**	**D**
1	**10**	**5**	**7**	**8**
2	**11**	**4**	**9**	**10**
3	**8**	**4**	**9**	**7**
4	**7**	**5**	**6**	**4**
5	**8**	**9**	**7**	**5**

[12]

(ii) For a certain element of work, the basic time is established to be 20 seconds. If for three observations, a time study observer records ratings of 100,125 and 80 respectively, on a '100 normal scale' what are the observed timings? [6]

Answer:

2. (i)

Probability distribution (cash receipts)

Cash receipts	Probability	Cum. Prob.	Range	Range for simulation
30	0.20	0.20	0 – 0.20	0 – 0.19
36	0.25	0.45	0.20 – 0.45	0.20 – 0.44
42	0.40	0.85	0.45 – 0.85	0.45 – 0.84
99	0.15	1.00	0.80 – 1.00	0.85 – 0.99

Probability distribution (cash Payment)

Cash receipts	Probability	Cum. Prob.	Range	Range for simulation
30	0.15	0.15	0 – 0.15	0 – 0.14
39	0.40	0.55	0.15 – 0.55	0.15 – 0.54
57	0.25	0.80	0.55 – 0.80	0.55 – 0.79
60	0.20	1.00	0.80 – 1.00	0.80 – 0.99

Month wise Cash flow Projections (₹ Crores)

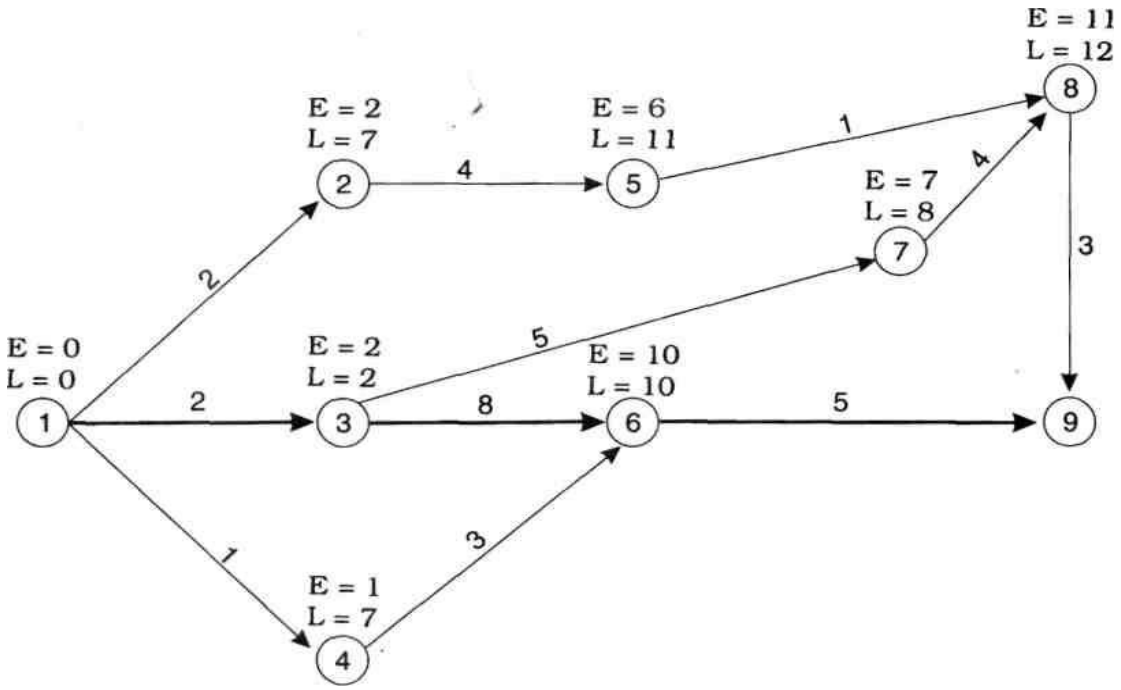
Month	Opening balance	Receipts	Payments	Closing Balance
1	15	30	57	-12
2	-12	36	39	-15
3	-15	42	39	-12
4	-12	36	39	-15
5	-15	42	39	-12
6	-12	42	60	-30

7	-30	42	57	-45
8	-45	42	33	-36
9	-36	99	57	6
10	6	42	57	-9
11	-9	99	39	51
12	51	30	57	24

- Probability of falling short of cash = No. of short balance projected months/total number of months = 9/12 = 0.75
- Average monthly shortfall = $\frac{12 + 15 + 12 + 15 + 12 + 30 + 45 + 36 + 9}{9}$

  = ₹20.67 crores
- In this situation, there shall be no shortfall. As such the probability of cash shortfall (with overdraft facility) = nil

(ii)



The critical path is 1 – 3 – 6 – 9. Its duration is 15 days.

Activity	Duration	ES	LF	EF	LS	TF
1 -2	2	0	7	2	5	5
1 -3	2	0	2	2	0	0
1 -4	1	0	7	1	6	6
2 -5	4	2	11	6	7	5
3 -6	8	2	10	10	2	0
3 -7	5	2	8	7	3	1

4 -6	3	1	10	4	7	6
5 -8	1	6	12	7	11	5
6 -9	5	10	15	15	10	0
7 -8	4	7	12	11	8	1
8 -9	3	11	15	14	12	1

3. **(i)** (a) The Purchase Price (C)= ₹1,00,000.

The determination of the optimal period of replacement of equipment A is given in table below:

Determination of Optimal Replacement Period

Year (I)	Op. Cost(M_t) (₹) (II)	Cum M_t (₹) (III)	Resale Value (S) (₹) (IV)	C-S (V)	T(n) (VI=III +V)	A(n) (VII=VI/I)
1	15,000	15,000	50,000	50,000	65,000	65,000
2	19,000	34,000	25,000	75,000	1,09,000	54,500
3	23,000	57,000	12,500	87,500	1,44,500	48,167
4	29,000	86,000	6,000	94,000	1,80,000	45,000
5	36,000	1,22,000	4,000	96,000	2,18,000	43,600
6	45,000	1,67,000	4,000	96,000	2,63,000	43,833
7	55,000	2,22,000	4,000	96,000	3,18,000	45,429

Since the average cost corresponding to the 5-yearly period is the least, the optimal period for replacement =5 years.

(b) As the minimum average cost for equipment B is smaller than that for equipment A, it is prudent to change the equipment. To decide the time of change, we would determine the cost of keeping the equipment in its 3rd,4th and 5th year of life and compare each of these values with ₹36,000 (the average cost of equipment B).The equipment A shall be held as long as the marginal cost of holding it would be smaller than the minimum average cost for equipment B. The calculations are given as below:

Year	Operating Cost	Depreciation	Total Cost
3	23,000	12,500(=25,000 -12,500)	35,500
4	29,000	6,500(=12,500-6,000)	35,500
5	36,000	2,000(=6,000-4,000)	38,000

Since the cost incurred in keeping the equipment A in the third and the fourth years is less than the average cost for equipment B, the replacement should be done after 2 years.

(ii) Quality control (QC) is a procedure or set of procedures intended to ensure that a manufactured product or performed service adheres to a defined set of quality criteria or meets the requirements of customer. Quality control is a process by which entities review the quality of all factors involved in production. It is a process through which a business seeks to ensure that product quality is maintained or improved and manufacturing errors are reduced or eliminated. Quality control requires the business to create an environment in which both management and employees strive for perfection.

The following are the main objectives of quality control programme:

- To assess the quality of the raw materials, semi-finished goods and finished products at various stages of production process.

- To see whether the product conforms to the predetermined standards and specifications and whether it satisfies the needs of the customers.
- To reduce the wastage of raw materials, men and machine during the process of production.
- To assess the various techniques of quality control, methods and processes of production and suggest improvement in them to be more effective.
- If the quality of the products deviates from the specifications, it is required to locate the reason for deviations and to take necessary remedial steps so that the deviation should not be recurred.
- To suggest suitable improvements in the quality or standard of goods produced without much increase or no increase in the cost of production. New techniques in machines and methods may be applied for this purpose.

4.(i)

Introducing Dummy:

	Machines				
Operators	A	B	C	D	Dummy
1	10	5	7	8	0
2	11	4	9	10	0
3	8	4	9	7	0
4	7	5	6	4	0
5	8	9	7	5	0

Opportunity Loss matrix

	Machines				
Operators	A	B	C	D	Dummy
1	1	6	4	3	11
2	0	7	2	1	11
3	3	7	2	4	11
4	4	6	5	7	11
5	3	2	4	6	11

Row reduction							Column reduction					
Operators	Machines						Operators	Machines				
	A	B	C	D	Dummy			A	B	C	D	Dummy
1	0	5	3	2	10		1	0	5	3	1	3
2	0	7	2	1	11		2	0	7	2	0	4
3	1	5	0	2	09		3	1	5	0	1	2
4	0	2	1	3	07		4	0	2	1	2	0
5	1	0	2	4	09		5	1	0	2	3	2

Minimum lines to cut zeros

	Machines

Operators	A	B	C	D	Dummy
1	0	5	3	1	3
2	0	7	2	0	4
3	1	5	0	1	2
4	0	2	1	2	0
5	1	0	2	3	2

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

Optimal Assignment

	Machines				
Operators	A	B	C	D	Dummy
1	[0]	5	3	1	3
2	0	7	2	[0]	4
3	1	5	[0]	1	2
4	0	2	1	2	[0]
5	1	[0]	2	3	2

Computing maximum production

Operators	Machines	Units of production
1	A	10
2	D	10
3	C	9
4	Dummy	0
5	B	9
Total		38

(ii) (Observed time) × (Observed rating)= (Basic or normal time) × (standard rating)

$$\text{Observed time} = \frac{(\text{Basic or normal time}) \times (\text{Standard rating})}{\text{Observed rating}}$$

Basic or normal time =20 seconds
Given, standard rating =100
For observation no. 1, observed rating =100

$$\text{Observed time} = \frac{20 \times 100}{100} = 20 \text{seconds}$$

$$\text{For observation no. 2, observed time} = \frac{20 \times 100}{125} = 16 \text{ seconds}$$

$$\text{For observation no. 3, observed time} = \frac{20 \times 100}{80} = 25 \text{ seconds}$$

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) Half-duplex is a mode of data ……..
(ii) ---------- basically sends a mail to the e-mail address of the receiver.
(iii) People soft is an -------- package.
(iv) ---------- allows numbers of jobs processed simultaneously.
(v) ---------- are the procedures and rules for inter-computer communication.

(b) Expand the following abbreviations: [1 x 5 =5]
(i) RISC
(ii) PROM
(iii) CODASYL
(iv) OLAP
(v) WAIS

(c) State whether following statements are true or false: [1x 4 =4]
(i) Interpreter translates a whole program.
(ii) Cache memory is a very fast RAM.
(iii) In multiprogramming, one CPU processes a number of programs by time-sharing technique.
(iv) Tree topology is a combination of Ring topologies.

Answer:

5. (a) (i) Transmission
(ii) Mail service
(iii) ERP
(iv) Time sharing
(v) Protocols

(b) (i) Reduced Instruction Set Computing
(ii) Programmable Read Only Memory
(iii) Committee of Conference on Data System Language
(iv) On-line Analytical Processing
(v) Wide Area Information Service

(c) (i) False. Interpreter translates the source program line by line.
(ii) True
(iii) True.
(iv) False. Tree topology is a combination of Bus topologies.

6. (i) Describe Supply Chain Management. [6]
(ii) Discuss Peer-to-peer architecture and its benefits. [3]
(iii) List the advantages and disadvantages of in-house development of software. [5]
(iv) State the objectives of database. [4]

7. (i) Describe the need for Office Automation System. [6]
(ii) Explain the terms Auditing around the computer and Auditing through the computer. [4]

(iii) Explain the term Distributed Data Processing. [4]
(iv) Describe data mining. [4]

8. (i) List the benefits of using electronic cash. [3]
(ii) State the advantages of internet. [7]
(iii) Discuss the application of electronic payment system. [5]
(iv) State the three sub-systems of EDI's process. [3]

Answer:

6. (i) Supply chain management (SCM) is the management of a network of interconnected businesses involved in the provision of product and service packages required by the end customers in a supply chain. Supply chain management spans all movement and storage of raw materials, work-in-process inventory and finished goods from point of origin to point of consumption. It is a cross function approach including managing the movement of raw materials into an organization, certain aspects of the internal processing of materials into finished goods and the movement of finished goods out of the organization and toward the end-consumer.

As organizations strive to focus on core competencies and becoming more flexible, they reduce their ownership of raw material sources and distribution channels. These functions are increasingly being outsourced to other entities that can perform the activities better or more cost effectively. The effect is to increase the number of organizations involved in satisfying customer demand, while reducing management control of daily logistics operations. Less control and more supply chain partners led to the creation of supply chain management concepts. The purpose of supply chain management is to improve trust and collaboration among supply chain partners. Thus improving inventory visibility and the velocity of inventory movement. Supply chain management, then, is the active management of supply chain activities to maximize customer value and achieve a sustainable competitive advantage. It represents a conscious effort by the supply chain firms to develop and run supply chains in the most effective and efficient ways possible. Supply chain activities cover everything from product development, sourcing, production and logistics, as well as the information systems needed to coordinate these activities.

The organizations that make up the supply chain are linked together through physical flows and information flows. Physical flows involve the transformation, movement and storage of goods and materials. They are the most visible piece of the supply chain. But just as important are information flows. Information flows allow the various supply chain partners to coordinate their long-term plans and to control the day-to-day flow of goods and material up and down the supply chain.

(ii) Peer to peer architecture – In this network there are no dedicated servers. All computers are equal and therefore termed as peer. Under this type of architecture, each workstation has equivalent capabilities and responsibilities. It is simpler and less expensive but under heavy load condition their performance is good.

The benefits of peer-to-peer architecture are:

- Architecture is simple in design and maintenance.
- Cost of network is low.

- Network is not totally reliant on a particular computer.
- Each computer can provide backup copies of its files to others for security.

(iii) Advantages of in-house development option

- Best fit with the company requirements
- Have control over software improvements
- Have all of the required features
- Main core competencies and maintain level of quality service
- Make a distinction with other companies

Disadvantages of in-house development option

- Required more IT personnel
- High overhead cost
- Time consuming
- Problem with usability of the system
- High switching cost
- Difficult to update to newer technology

(iv) The objectives of database are as under:

- Control redundancy –It is used to avoid unnecessary duplication of efforts, wastage of storage space and inconsistency in files on updation.
- Privacy and security – It should provide a security and authorization subsystem so that only intended users will be authorized to access all information in the database. On the other hand, other users should be allowed only to retrieve data. There is other category of users also who should have right for both to retrieve and to update database.
- Ease of learning and use – It makes life easy by presenting data in a presentable form such as linked tables etc. User application programs can operate on data by invoking specific operations through their names and arguments. Users do not care about how the operation is implemented.
- Providing multiple user interface – It basically invokes query languages, programming languages interfaces, forms, menu driven interfaces, etc.
- Recovery from failure – It should also aim for providing facilities for recovering from hardware or software failures. Other objectives may include data independence, more information at low cost, accuracy, integrity and data independence.

7. (i) Office Automation System (OAS) refers to the use of mechanical, electrical and electronic devices to enhance communication in the work place and increase the efficiency and productivity of knowledge workers. OAS is needed for the following:

- Word processing – It is the use of an electronic device that automatically performs many of the tasks necessary to create written documents such as letters, memos, etc.
- E-mail
- Voice mail – Voice mail is just like electronic mail and performs storing, accessing, retrieving and distributing message using the telephone.
- Audio conferencing.
- Video Conferencing.

- Computer conferencing – Computer conferencing is the use of a networked computer to all members of a problem-solving team to exchange information concerning the problem that is solved.
- Teleconferencing – Teleconferencing includes all three forms of electronically –aided conferencing – audio, video and computer.
- Facsimile transmission. Also known as fax, is the transfer of written or pictorial information by the use of special equipment that can read a document image at one end of a communication channel and make a copy at the other end.
- Electronic calendaring – It is the use of a networked computer o store and retrieve a manager's appointment calendar.
- Desktop publish – Desktop publishing is the use of a computer to prepare printed output, using software with sophisticated publishing capabilities.
- Videotext – Videotext is the use of optical character recognition to convert paper or microfilm records to a digital format for storage in a secondary storage device for easy retrieval and processing.
- Multimedia system – Multimedia systems are well integrated systems that store retrieve and process different types of data such as text, graphics, images full motion video, audio and animation. It helps users to create, process, share and display information in a broad variety of formats.

(ii) Auditing around the computer is used to evaluate client's computer control. It involves verification of the corresponding output with the inputs. For example, multiplying unit price with the number of products sold to ensure that the total revenue figure is correct. The following steps are required in Auditing around the computer.

- Selecting of a critical output
- Verification of corresponding output with the input i.e. whether the processed transaction was complete and correct
- Verification of original source of input by locating it through audit trial.

Auditing through the Computer describes the various steps taken by auditors to evaluate client's software and hardware to determine the reliability of operations that is hard for human eyes to view and also test the operating effectiveness of related computer controls.

(iii) Distributed Data Processing (DDP) is a network of several computers in remote stations, each of which is linked to a single host computer. The larger central computer maintains the firm's master data-base and system log. Each remote system is fully independent computer that maintains its own local data base in addition to communicating with the master computer. These computers have their own processing facility and storage area.

These individual computers are tied together through a high speed data communication network. This allows individual computers to communicate with one another in a variety of ways depending on the CIS requirements.

(iv) The data-mining definition is defined as the process of extracting previously unknown, comprehensible and actionable information from large data bases and using it to make crucial business decisions. Data mining also can be defined as the computer-aid process

that digs and analyzes enormous sets of data and then extracting the knowledge or information out of it. By its simplest definition, data mining automates the detections of relevant pattern in database. Data mining uses artificial intelligence techniques, and advanced statistical tools to reveal trends, patterns and relationships which might otherwise have remained undetected.

8. (i) Benefits of using Electronic Cash are:

Potential fraud is reduced – When the bank receives the electronic cash, it verifies the serial number, it deletes the serial number and takes it out of circulation forever. The same number cannot be re-used.

Preference of Merchant – Merchant will prefer electronic cash since it guarantees the payment.

Confidentiality of customer – Customer's confidential information regarding his bank account etc. is not disclosed.

(ii) Advantages of INTERNET

- Internet provides high speed and accurate information and data flow.
- It is available round the clock
- It provides scope of interactive communication between users.
- Internet is the server of knowledge. It can provide information on any topic one requires.
- There is no biasness or discrimination in the internet. Internet treats all people connected to it equally.
- Internet can provide information the moment it is requested. Faster information flow makes the decision making process quick and efficient.
- It allows business operation in distant places without face to face interaction.
- Internet helps in reduction of unnecessary expenditure on stationary, printing, delivery changes etc. No stationary or printing charges are incurred as information travel electronically. Mailing is done at the cost of local phone call, so no delivery charges is required.

(iii) Application of Electronic Payment System:

- Credit Card payments
- Electronic Fund Transfer
- Ordering Demand Drafts in Banks
- Booking of railway tickets/reservations
- Booking of movie tickets
- A shopping through e-commerce
- Transfer of money from one bank to another
- Paying telephone bills/Insurance premium etc.

Thus the application of electronic payment system has extended to various areas like Banking, E-commerce, Airlines, Railways, and Insurance & Telecom Industries.

(iv) Electronic Data Interchange (EDI) is the structured transmission of data between organizations by electronic means. EDI's process comprises three sub-systems:

- Translation : EDI software converts files from trading partners into EDI standard format, called EDI document.
- Transmission : EDI documents are transmitted using mutually agreed communication method.
- Retranslation : When a trading partner receives a transaction, it is retranslated with the help of EDI enabled software into a format which can be used as its own business document format.