INTERMEDIATE EXAMINATION
GROUP II
(SYLLABUS 2008)

SUGGESTED ANSWERS TO QUESTIONS
JUNE 2014

Paper-9 : OPERATION MANAGEMENT AND INFORMATION SYSTEMS

Time Allowed : 3 Hours **Full Marks : 100**

The figures in the margin on the right side indicate full marks.
All workings should form part of your answer.

OPERATION MANAGEMENT

Answer **Question No. 1** which is compulsory and **any two** questions from the rest.

1. (a) Match the terms in Column I with the relevant terms in Column II: 0.5×8

Column I		Column II	
(i)	air blasting small shots to increase surface hardness	A.	Lapping
(ii)	the process of polishing a work by-means of abrasive materials, to give fine finish	B.	Tapping
(iii)	machining a large flat surface on metal	C.	Belt Conveyor
(iv)	to make threads on the inside surface of a hole	D.	Plaining Machine
(v)	machining cylindrical and tapered surfaces	E.	Shot penning
(vi)	move heavy loads within a circular area	F.	Grinding Machine
(vii)	place where materials tend to pile up or produced at speed less rapid than the previous or subsequent operations	G.	Product Layout
(viii)	material is fed into the first machine and finished products come out of the last machine	H.	Bottlenecks

(b) Examine each statement and indicate whether it is 'True' or 'False': 1×5

(i) There is a limit beyond which labour productivity cannot be improved.
(ii) When demand does not exist in the market, we should start Production Incentives.
(iii) Breakdown maintenance doesn't require use of standby machines.
(iv) Work study aims at finding the best and most efficient way of using the available resources.
(v) Mechanisation and Automation lower employee morale.

(c) Put an appropriate word in blank position: 1×5

(i) Machines are purchased or replaced to _____ the productive capacity.
(ii) _____ are machines or equipments that combine video camera and computing technology and have been integrated into the inspection of products for controlling quality.
(iii) _____ can be determined using the Northwest Corner Rule.
(iv) A _____ is an appliance which holds the work when it is machined.

(v) Taylor originated the idea of _____relationships in an organisation.

Answer:

1. (a) (i) – E, (ii) – A, (iii) – D, (iv) – B, (v) – F, (vi) – C, (vii) – H, (viii) – G.

(b) (i) TRUE
(ii) FALSE
(iii) FALSE
(iv) TRUE
(v) FALSE

(c) (i) Increase
(ii) Vision Systems/Automated Inspection Systems
(iii) IBFS
(iv) Fixture
(v) Functional

2. (a) The annual sales of truck tyres manufactured by a company are as follows:

Year	(X)	2008	2009	2010	2011	2012
Sales ('000 units)	(Y)	25	34	45	38	53

Fit a linear trend equation to the sales figures and estimate the sales for 2013. 4

(b) Write short notes on: 2×2
(i) Routine Maintenance
(ii) Maintenance Request

(c) Expand and briefly explain: 2×2
(i) CT
(ii) NC

(d) (i) Find the machining cost of a M.S. bar on a lathe from the following data: R.P.M. of the Job = 300. Feed of tool per revolution of job = 0.5 mm. Depth of cut = 2 mm. Diameter of raw material = 50 mm. Diameter of finished job = 30 mm. Length of Job = 1000 mm. Machining cost = ₹ 3 per hour. 3

(ii) Mention the major objectives of Waste Management. 3

Answer:

2. (a)

Computation of Trend Values

Years	Time Deviation from Midpoint 2010 X	Sales in ('000 units) Y	Squares of time dev. mX^2	Product of time dev. and sales XY
2008	-2	25	4	-50
2009	-1	34	1	-34
2010	0	45	0	0
2011	+1	38	1	+38
2012	+2	53	4	+106
n=5	ΣX=0	ΣY=195	$\Sigma X^2=10$	ΣXY=+60

Regression equation of Y on X –
Y = a + bX
For calculating the values of a and b

$$a = \frac{\sum Y}{n} = \frac{195}{5} \text{ or } 39$$

$$b = \frac{\sum XY}{\sum X^2} = \frac{60}{10} = 6$$

Hence, regression equation comes to Y = 39 + 6X. With the help of this equation, the trend value for 2013 can be calculated as follows –

Y 2013 = 39 + 6 (3) = 39 + 18 = 57

The estimated sales for 2013 will be 57,000 units.

(b) (i) Routine Maintenance:

It includes lubrication, cleaning, periodic overhaul; etc. This is done while the equipment is running or during preplanned shut-downs. Running maintenance is the work which can be carried out while the facility is in service.

(ii) Maintenance Request:

This must be made in writing to a central point in the organization. No work should be carried out without the knowledge and approval of maintenance supervision - if this discipline is not followed by the organization, it leads to wastage of skilled manpower and inability of the maintenance personnel to schedule essential maintenance work.

(c) (i) CT- Cycle Time. It is the amount of time for which a unit that is assembled is available to any operator on the line or it is the time the product spends at each work station.

$$\text{Cycle Time (CT)} = \frac{\text{Available time period}}{\text{Output units required/period}} = \frac{AT}{\text{output}}.$$

(ii) NC- Numerical Control. Many machines such as lathe, milling, drilling and boring machines are now designed for electronic control called numerical control (NC). The numerically controlled (NC) machines have control systems which read instructions and translate them into machine operations.

(d) (i) Number of revolutions in one traverse of 1,000mm. $= \frac{1{,}000mm.}{0.5mm.} = \frac{10{,}000}{5} = 2{,}000$

Total depth of cut = ½ (50 – 30) mm. = 10mm. Depth of cut = 2mm.

The number of transverse traverse over the job from end to end = 10/2 times = 5 times.

Thus the total number of revolutions of the job = 2,000 × 5 = 10,000

R.P.M. of the job = 300

Machine time = $\frac{10{,}000}{300}$ min. = 33.33 min

Cost of machining = $\frac{₹3 \times 33.33}{60}$ = ₹1.67.

(ii) The major objectives of Waste Management are as follows:

- Minimisation of overall waste.
- Maximisation of previous resources.
- To cut down on all the unnecessary activities.
- To increase profitability.
- To inculcate a sense of cost-effectiveness.
- To follow Total Quality Management (TQM).
- To aspire for international recognition.

3. (a) Dev Company has two factories A and B located at some distance and three regional warehouse R. S. T. The transport manager must schedule shipments for the coming week according to the following:

Warehouse R requires	**70 tonnes**
Warehouse S requires	**60 tonnes**
Warehouse T requires	**50 tonnes**
Capacity of factory A	**100 tonnes**
Capacity of factory B	**200 tonnes**

Transportation costs are as follows:

From factory A to warehouse R	**₹ 30 per tonne**
From factory A to warehouse S	**₹ 10 per tonne**
From factory A to warehouse T	**₹ 50 per tonne**
From factory B to warehouse R	**₹ 20 per tonne**
From factory B to warehouse S	**₹ 40 per tonne**
From factory B to warehouse T	**₹ 60 per tonne**

Find the least cost shipping schedule. 6

(b) The company is engaged in the assembly of a wagon on a conveyor. 500 wagons are required per day. Production time available per day is 420 minutes. The other information is given below regarding assembly steps and precedence relationships. Find the minimum number of work stations required. 6

The element times and precedence relationships.

Task	Time (Sec.)	Task that must precede
A	15	---
B	20	A
C	12	B
D	12	---
E	10	D
F	8	C
G	8	C
H	10	E
I	15	E
J	20	F, G, H, I
K	5	---
Total	135	---

(c) State the principles to be borne in mind while selecting and applying various material

handling equipment. **6**

Answer:

3. (a)

Least Cost Method

Total Demand = (70 + 60 + 50) = 180
Total Supply = (100 + 200) = 300

Introduce dummy warehouse with demand 120 & zero transportation cost.

	Warehouse - R	Warehouse - S	Warehouse - T	X	Total Supply
Factory A	30	10	50	0	100
Factory B	20	40	60	0	200
Total Demand	70	60	50	120	300

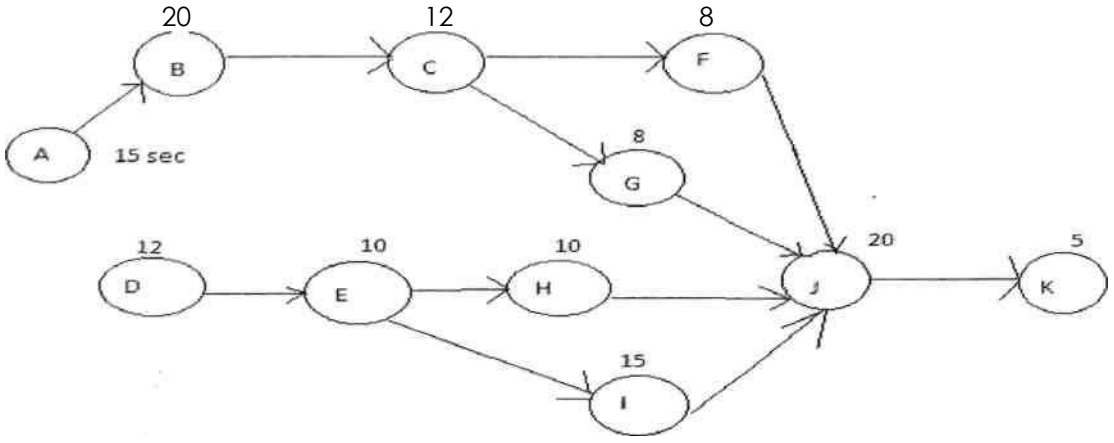
	Warehouse - R	Warehouse - S	Warehouse - T	X	Total Supply
Factory A	30	50 [60]	10 [40]	60	100
Factory B	~~40~~ [70]	~~20~~	~~0~~ [10]	~~60~~ [120]	200
Total Demand	70	60	50	120	300

In the above table it can be observed that m+n-1 =5. It means 5 cells are occupied and the rule m+n-1 is satisfied. Hence the solution is feasible.

The least cost transportation schedule will be as follows:

From Factory A to Warehouse – S – 60 tonnes x 10 = 600
From Factory A to Warehouse – T – 40 tonnes x 50 = 2000
From Factory B to Warehouse – R – 70 tonnes x 20 = 1400
From Factory B to Warehouse – T – 10 tonnes x 60 = 600
4600

(b) Precedence diagram is constructed as per the given details:



Determination of cycle time:

$$Ct = \frac{\text{Production time/day}}{\text{Output/day}} = \frac{420 \times 3}{500} = \frac{25{,}200}{500} = 50.4$$

Theoretical number of work stations required:

$$N = \frac{\text{Total time}}{\text{Cycle time}} = \frac{135}{50.4} = 2.67 \approx 3 \text{ workstations.}$$

(c) Principles to be borne in mind while selecting and applying various materials handling equipment are:

- As far as possible, management should avoid; using the complicated mechanisms and controls; it is better, to use the simplest possible equipment to handle the materials.
- Before considering the purchase of new equipment; the activities must be planned and the equipment needs must be analysed.
- Before purchasing the equipments, comparative costs of various equipments must be determined and analysed.
- Different equipment must be used for different jobs.
- Equipment selected for handling materials must be flexible in its application.
- It is necessary that equipment must be managed and maintained properly.
- It is necessary to ensure that obsolete methods and equipment are replaced periodically.
- Management should ensure that the new handling equipment must be put to effective use.
- Management should try to standardize equipment, if possible.
- Selection of equipment should be based on the principle that the equipment should minimize the ratio of mobile equipment dead weights to payloads.
- The building must big enough to keep the materials handling equipment.

4. (a) Aztec Power Company has noticed that the system has been experiencing the following number of failures for months over the past 1 year.

Number of failures	**0**	**1**	**2**	**3**
Number of months this occurred	**4**	**2**	**3**	**3**

Each breakdown costs an average of ₹ 25,000/-. Preventive maintenance can be carried out for a cost of ₹ 8,000/- to limit the failures to an average of one per month. The company seeks your advice on which policy is most suitable for adoption. 4

(b) An item is produced in a plant having a fixed cost of ₹ 6,000 per month, variable cost of ₹ 3 per unit and a selling price of ₹ 5 per unit. Determine:
(i) The break-even volume.
(ii) If 4,000 units are produced and sold in a month, what would be the profit?
(iii) How many units should be produced to earn a profit of ₹ 4,000 per month? 6

(c) Explain the different Point Rating methods of Job Evaluation. 4

(d) (i) What are the technical factors on which equipment is replaced? 2
(ii) List the various forms of capacity planning. 2

Answer:

4. (a) Converting the frequencies to a probability distribution and determining the expected cost per month of failures.

No of Failures	Frequency in Months	Frequency in %	Expected Value
0	4	0.333	0.000
1	2	0.167	0.167
2	3	0.250	0.500
3	3	0.250	0.750
		TOTAL	1.417

Failure cost per months; Expected Cost = 1.417 × ₹25,000 = ₹35,425.

Preventive Maintenance Cost per month:

Average cost of one failure/month	=	₹25,000
Maintenance contract cost/month	=	₹8,000
Total	=	₹33,000

Thus preventive maintenance policy is best suited.

(b) (i) Break-even-volume

Fixed cost (FC) = ₹6,000 month
Variable cost (VC) = ₹3 per unit
Selling price (SP) = ₹5 per unit

Let Q be the break even volume per month, then

Total cost	=	Fixed Cost+ (Variable cost/unit) × Quantity
TC	=	FC + (VC ×Q)
	=	6,000 + 3Q
Sales Revenue	=	Selling price per unit × Quantity
	=	5Q

For Q to be break- even-volume,

Sales Revenue	=	Total cost	
i.e., 5Q	=	6,000 + 3Q	
2Q	=	6,000	
Q	=	6,000/2	= 3,000 units/month

(ii) For Q = 4,000,

Profit	=	Sales Revenue – Total Cost
	=	SR – (FC+ VC × Q)
	=	(5 × 4,000) – (6,000 +3 ×4,000)
	=	(20,000) – (6,000 + 12,000)
	=	₹20,000 – 18,000 = ₹2,000

(iii) For profit of ₹4,000, Q is -

SR	=	FC + (VC) Q + profit
5Q	=	6,000 + 3Q + Profit
5Q – 3Q	=	₹(6,000 + 4,000)
2Q	=	₹10,000
Q	=	10,000/2
	=	5,000 units.

(c) There are three point rating methods of analytical evaluation of job. They are:

I. Straight point method: This method assigns equal weights for each characteristic. When evaluating a job under this system, it is assumed that all the characteristics have ranges of values between same maximum and minimum points.

II. Weighted point method: In this method different points are assigned to the different characteristics of doing jobs.

III. Direct to Money Methods: After selecting the job characteristics, ten key jobs whose rates are believed to be correct, are taken and the present wage rates of these jobs are distributed to the job characteristics by each analyst. The jobs are then ranked by the analysts for each characteristic in order of the degree to which that characteristic is present. This serves as a check to show up any errors made in the original distribution of the wages rate to the various characteristics.

(d) (i) Following are the technical factors based on which equipment is replaced:

- Inadequacy from the stand paint of range, speed, accuracy, strength, rigidity, output and capacity.
- Obsolescence and equipment worn out condition.
- Special advantage of the new machine as to easiness of set ups convenience of operation, safety, reliability performance, control panels and special features.
- Flexibility and versatility of the machine.

(ii) Various forms of Capacity Planning:

- Based on time- horizon
  (i) Long-term capacity planning and
  (ii) Short-term capacity planning

- Based on amount of resources employed
  (i) Finite capacity planning and
  (ii) Infinite capacity planning.

Information Systems

Answer **Question No. 5** which is compulsory and **any two** questions from the rest.

5. (a) Put an appropriate word in blank position: 1×5=5

(i) Software which is directed to destroying information in a computer is known as _____. .
(ii) _____ in Information System mean the policy, procedure and system followed to ensure the desired objectives,
(iii) The software which provides integration of information related to all functional areas, with the help of DBMS is referred to as _____ .
(iv) Traditional EDI communication route is through_____, a third party service provider that receives, stores and transmits data.
(v) In _____ , one CPU processes a number of programs by time-sharing technique.

(b) Each statement below in either TRUE or FALSE. Indicate the same in your answers:1×5=5

(i) In an organisation having a computer based Information System, the security of data is the responsibility of the Database Administrator.

(ii) In Binary Numbering System 'bits' and 'bytes' convey different meaning.
(iii) Operational management staff are mainly involved in strategic decision making.
(iv) An on-line system is necessarily a real-time system but the reverse is not true.
(v) To separate one record from another record, inter record gap (IRG) is maintained in a magnetic tape.

(c) Expand the following abbreviations: 1×4=4
(i) CBIS
(ii) EIS
(iii) CASE
(iv) TACACS

Answer:

5. (a) (i) Virus
(ii) Controls
(iii) ERP Package
(iv) Value added network (VAN)
(v) Multi- programming

(b) (i) TRUE
(ii) TRUE
(iii) FALSE
(iv) FALSE
(v) TRUE

(c) (i) CBIS – Computer Based Information System
(ii) EIS – Executive Information System
(iii) CASE – Computer Aided Software Engineering
(iv) TACACS – Terminal Access Controller Access Control System.

6. (a) State the objectives of Information Systems Audit. 4
(b) Explain the sub-systems of EDI and list down its advantages. 5
(c) In a flow chart what are the following symbols used to indicate? 2

(d) Mention the exercises undertaken in the System Evaluation and review phase. 4
(e) Briefly describe the three categories of Information System Control. 3

Answer:

6. (a) Information Systems Audit supports the following objectives:

- Safeguarding of assets which include hardware, software, people i.e. knowledge, data files, system documentation etc.
- Data integrity i.e. completeness, soundness, purity and veracity,
- System effectiveness i.e. it has knowledge of user needs and facilitates decision making process in the organisation,
- System efficiency i.e. use of minimum resources to fulfill the desired objectives, and
- Statutory compliance i.e. rules, regulations, or conditions to be complied with under

various Acts, Laws, Regulations etc.

(b) 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.

Advantages of EDI:

- Reduced manual entry leading to an increased accuracy;
- Reduced clerical overhead resulting lowering cost;
- Faster delivery of data;
- All business transactions are immediately acknowledged.

(c) In a flow chart the following symbols are used to indicate – Processing and Decision Box respectively.

(d) In the system evaluation phase, critical evaluation is made on whether the system performs in the expected level and targeted cost-benefit is achieved. The scope of improvement is also identified.
The following exercises are undertaken in this stage:
- Review the users' initial feedback
- Evaluation of performance of system in terms of speed, reliability and timeliness of reports
- Storage and backup provisions
- Cost Benefit Analysis
- Evaluation of internal controls
- Evolving measures for continuous improvement etc.

(e) Three categories of Information System Control are:

(i) Preventive controls are designed to guard against risks inherent in certain data processing operations.
(ii) Detective controls are intended to arrest the consequences of what may bypass preventive control.
(iii) Corrective controls are detective types of controls that can be considered as complete only when key supplement corrective controls like formation of audit trails, installation of adequate backup and recovery procedures, implementation of automated error detection and correction techniques and other similar types.

7. (a) Match the following: **0.5x8=4**

	Column I		Column II
1	Key field	(a)	Defining user profile based on physical parameters and behaviour
2	Open system	(b)	Written in High-Level Language.
3	Firmware	(c)	A process to improve operational efficiency of the organization.
4	Source Program	(d)	Used for searching a particular record for processing, display, editing, etc.
5	Knowledge	(e)	Deal with low-level machine instructions to be carried out by different circuits.
6	Decision Making	(f)	Physical replica of the system based on different scale from original.
7	Iconic Scale Model	(g)	Mix of information, experience and evaluation.
8	Biometric Security	(h)	Seamless connection of any computing devices, regardless of size and operating system.

(b) Kindly mention the steps involved in decision making process. **4**

(c) Depending on the level of management, different functional areas will require various types of MIS reports. Keeping this in view, you are required to list out kind of reports required in Sales Management in Top Level. Middle Level and Operational Level Reports. **6**

(d) Give the different classifications of an Operating System. **4**

Answer:

(a) 1 – d, 2 – h, 3 – e, 4 –b, 5 – g, 6 – c, 7 – f, 8 – a.

(b) Decision making process follows process a scientific system and the steps involved are:

(i) Identification of problem and diagnosis of the problem;
(ii) Collection of relevant Information;
(iii) Search for alternatives and evaluation of them;
(iv) Decision structuring;
(v) Selecting preferred option;
(vi) Communication to relevant action points;
(vii) Implementation.

(c) Sales Management in –

Top- level (Strategic information)

- Information on new product or new market
- Information on market share
- Analysis of competitors strategy
- Sales growth or fall

Middle Level (Tactical information)

- Actual sales - product wise with targets
- Sales Variance and their causes
- Performance of different sales offices

Operational Level (Operational information)

- Sales details - branch wise product wise
- Individuals sales personnel performance
- Sales expenses details.

(d) Operating System may be classified as:

- Multi-user - It allows more than one users at a time. Example MVS, Unix etc.
- Multi-processing - This kind of OS has the ability to process more than one process at a time by allocating multiple CPU's to different processes. The competitive resources are allocated to different processes depending on their availability. If the resource is not available, it is kept on the hold status.
- Multi-tasking - This kind of OS allows processing of more than one program at a time. The only CPU in the system is allocated to a task when others are allocated peripheral devices to do Input/output job. Example Unix, Windows NT etc.
- Multithreading - This kind of OS allows different parts of one program to run concurrently.

8. Write short notes on any six of the following: 3×6=18

(i) Structured Programming
(ii) Primary Memory
(iii) Time-Sharing Companies
(iv) Random (Direct) File Organisation
(v) Three modes of data transmission over a channel
(vi) Some common computer frauds
(vii) Advantages of OLTP
(viii) Stages of SLDC

Answer:

8. (i) Structured programming means the art of developing programs in a structured fashion to make it readable and maintainable. The rules of structured programming are as follows:

A. Logical flow will have one entry and one exit.
B. Three basic structure:
* Sequence of execution (DO)
* If --------- GOTO
* If --------- Then -------Else
C. No haphazard use of branching using GOTO
D. Top-down or bottom-up approach

(ii) Primary memory is for storing program, data, and doing the processing. In fact, it can be visualized as consisting of five areas for storing different sets of programs and related data as given below:

a. Operating System i.e. Supervisor Program
b. Program (software) storage area to store program for execution
c. Input storage area for holding data from input devices
d. Working storage area for processing the data
e. Output storage area for temporary storage of results as a buffer which are sent to

output devices.

(iii) In earlier days when hardware used to be costly and users were using only selective application systems for data processing, the time sharing facilities provided by different companies on their Computer were found to be cost-efficient and widely acceptable to many users. Some Companies took the opportunities for business purpose. Generally, companies used to buy a mainframe computers with multi-users facilities and charges used to be on the basis of usage time of different components like CPU, Printers, Disk, Magnetic tape etc.

(iv) Under this type of file organisation, data are stored sequentially on the value of the key field irrespective of order of creation of records. Provision of access to a record of having a particular key value is efficient. The access is not done sequentially rather direct. This is why, file organisation is called direct or random. The position of the record with a particular value of key field is obtained by arithmetic calculation. This helps to have direct access to the record.

(v) Three methods of data transmission over a channel are:

a. Simplex — uni-directional where feedback information is not required, use simplex communication. Example- Radio, Television.
b. Half-duplex — both directional but either sending or receiving at a time, Example- Internet surfing.
c. Full-duplex — data can travel both directions at a time. Example- telephone system.

(vi) Some common computer frauds are:

a. Hacking - Unauthorized access to software and information.
b. Cracker - Unauthorized access to machine with intention of damage to data, software etc.
c. Password cracking - To have an access to systems resources by decrypting password.
d. Software piracy - Copying software for illegal use without paying due price.
e. Virus - Use of software to damage set of software/data files in the machine.
f. Trap door - Access to system by passing normal systems control.
g. Super-zapping - Access to special system programs bypassing normal systems control.

[Students can mention any 6 of the above.]

(vii) OLTP are being adopted in wider scale to have the following advantages:

- It can serve multiple users at a point of time;
- Technology serves the facilities to collect information from multi-locations;
- High flexibility in information processing etc.

(vii) Stages of SLDC are:

1. System Proposal;
2. System Study;
3. System Design;
4. Program Development;
5. System Implementation;
6. System Evaluation & Review;
7. System Maintenance.