

INTERMEDIATE EXAMINATION GROUP II

(SYLLABUS 2012)

SUGGESTED ANSWERS TO QUESTIONS JUNE 2016

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 questions are compulsory, subject to instruction provided against each question.

All workings must form part of your answer.

Assumptions, if any, must be clearly indicated.

Section – A

I. Answer the following questions which are compulsory: **2×10 = 20**

1. Answer all the questions:

- (a) Define 'Load chart'.
- (b) State the disadvantages of 'Vertical Integration'.
- (c) Fill in the banks with one word or Two:
 - (i) The _____ is the sum of the setup time and run time for a batch of parts that are run on a machine.
 - (ii) Efficiency is a ratio of the actual output of a process relative to some _____.
- (d) Write the formula for Input Efficiency.
- (e) State whether 'True' or 'False'.
 - (i) Regular spares are also called Rotable spares.
 - (ii) Role of the corrective maintenance department is almost active.
- (f) Name the activity denoted by the following standard symbols used in Process Charting:
 - (i)
 - (ii)
- (g) 'The characteristics of information vary with functions of levels of management'. Fill in the blanks (i) to (iv) in the following Table with regard to contents of report:

Characteristics of Information	Top Management	Middle Management	Operational Management
Focus of Planning and Management	Strategic Planning	(i)	(ii)

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Boundary	(iii)	(iv)	Internal
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- (h) Please complete the following sentence by putting in appropriate words in the blank positions:
'Configuration of an ERP system deals with handling of numerous usage controls, which can be switched _____ or switched _____, so as to balance its functionalities to extant needs. First thing to happen is to _____ specific modules needed and _____ these modules, as per the scope of the project.'
- (i) List two important responsibilities of Database Administrator in a database environment.
- (j) 'It is often said that we are in the information age, and that information is a valuable commodity.' Explain two areas in a business situation where information can be effectively used.

2. Match List A with List B: 1×5 = 5

List A	List B
(a) Simulation	(1) Controlling redundancy
(b) Quality Circle	(2) Reliability
(c) Insurance spares	(3) Voluntary group to identify problems
(d) Attribute of information	(4) Model of real phenomenon
(e) Using a DBMS	(5) High reliability and rare requirement

Answer I. 1:

- (a) A load schedule or load chart is a procedure for comparing the actual load (labour hours and machine hours) required to produce the products as per the MRS against the available capacity (labour hours and machine hours) in each week.
- (b) Disadvantages of vertical integration are:
- (i) Not attractive for low volumes.
 - (ii) High capital investment and operating costs.
 - (iii) Less ability to react more quickly to changes in customer demands, competitive actions and new techniques.
- (c) (i) The operation time is the sum of the setup time and run time for a batch of parts that is run on a machine.
(ii) Efficiency is a ratio of the actual output of a process relative to some standard.
- (d) Input efficiency = Actual consumption /Desired or standard consumption
- (e) (i) False.
(ii) False.
- (f) (i) Operation, (ii) Transportation or movement.
- (g) (i) Resource Management, (ii) Day-to-day activities, (iii) Internal & External, (iv) Internal.
- (h) Configuration of an ERP system deals with handling of numerous usage controls, which can be switched off or switched on, so as to balance its functionalities to extant

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needs. First thing to happen is to install specific modules needed and configure these modules, as per the scope of the project.

- (i) In a database environment, the primary resource is the database itself and the secondary resource is the DBMS and related software. Administering these resources is the responsibility of the **Database Administrator** (DBA). 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) Some areas in a business situation where information can be effectively used are:
 - (i) Information allows us to plan how to run our business more effectively - e.g. shops can stock what customers want, when they want it, and manufacturers can anticipate demand.
 - (ii) Marketing materials can be targeted at people and customers who could be interested in the products and services. This can lead to increased customer satisfaction and therefore profit

Answer I. 2:

List A	List B
(a) Simulation	Model of real phenomenon
(b) Quality Circle	Voluntary group to identify problems
(c) Insurance spares	High reliability and rare requirement
(d) Attribute of information	Reliability
(e) Using a DBMS	Controlling redundancy

Section B

II. Answer any three questions:

15×3=45

1. (a) A department works on 8 hours per day, 250 days a year and has the usage data of a machine, as given below: 6

Product	Annual demand (units)	Processing time (standard time in hours)
X	200	4.0
Y	300	6.0
Z	400	3.0

Determine the number of machines required.

- (b) 'Operations management is responsible for producing goods and / or services. In this context, define 'Operating System' and state the principal functions of an operating system. 1+4 = 5

- (c) The equation of the demand curve of a firm is $p = 12 - 04q$ and the equation of the total cost curve is $C = 06q^2 + 4q + 5$.

Determine price, output, total revenue and profit if the objective of the firm is to maximize profit. 4

Answer II. 1:

- (a) **Step 1:** To calculate the processing time needed in hours to produce product X, Y and Z in the quantities demanded using the standard time data

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Product	Annual demand (units)	Processing time needed (standard time in hours)
X	200	$4.0 \times 200 = 800$ hrs.
Y	300	$6.0 \times 300 = 1800$ hrs.
Z	400	$3.0 \times 400 = 1200$ hrs.
	Total	3800 hrs.

Step 2: Annual production capacity of one machine in standard hours = $8 \times 250 = 2000$ hours per year

Step 3: Number of machines required
= Work load per year/Production capacity per machine
= $3800/2000$
= 1.9 machines = 2 machines.

- (b) An **Operating System** is defined as a configuration of resources combined for the provision of goods or services.

The function of an operating system is a reflection of the purpose it serves for its customers. The following four principal functions identified below also relate to the basic four operations done in any organization:

1. **Manufacture:** Manufacturing function is the one which involves some physical transformation, or a change in the **form utility** of the resources. Something is physically created and the output consists of goods which differ physically (e.g., in terms of form, content etc.) from those materials input to the system.
2. **Transport:** This function of operating system provides a change in the **place utility** of something or someone in order to satisfy customer. The customer, or something belonging to the customer, is moved from place to place and thus results in the change in location. There is no major change in the form of resources.
3. **Supply:** This function provides a change in the **possession utility** of a resource, i.e., the ownership or possession of goods is changed. Unlike manufacture, outputs of the system are physically same as the inputs.
4. **Service:** This function primarily results in a change in the **state utility** of a resource. The principal common characteristic is the treatment or accommodation of something or someone. The state or condition of the physical outputs will differ from the inputs as they have undergone same kind of treatment.

- (c) It is assumed that total revenue = R and total profit = π

$$\text{So, } \pi = R - C = pq - C$$

$$\text{or, } \pi = (12 - 0.4q)q - (0.6q^2 + 4q + 5)$$

$$= 12q - 0.4q^2 - 0.6q^2 - 4q - 5$$

$$= -q^2 + 8q - 5.$$

The first order condition to maximize % requires, $d\pi/dq = 0$ or, $-2q + 8 = 0$

$$\text{or, } 2q = 8$$

$$\text{or, } q = 4$$

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$d^2 \pi / dq^2 = -2 < 0$. So the second order condition is also fulfilled.

Now, when $q = 4$,

$$p = 12 - 0.4(4) = 12 - 1.6 = 10.40$$

$$R = pq = 10.4(4) = 41.6 \text{ and}$$

$$\pi = -(4)^2 + 8(4)-5 = -16 + 32 - 5 = 11$$

2. (a) The main shaft of Calcinator has a very high reliability of 0.980. The equipment comes from abroad and has a high downtime cost associated with the failure of this shaft. This is estimated at ₹ 1.80 crores as the costs of sales lost and other relevant costs. However, this spare is quoted at ₹10 lakhs at present. Should the shaft spare be procured along with the equipment and kept or not? 4
- (b) Write down the formula for: $1 \times 3 = 3$
(i) Performance Ratio (as a percentage)
(ii) Throughput Ratio
(iii) Frequency of Breakdown
- (c) List the benefits of benchmarking. 8

Answer II. 2:

- (a) First Part: The expected cost of down-time
 $= (\text{Probability of failure}) \times (\text{Cost when break-down occurs})$
 $= (1 - 0.980) \times (\text{₹}1.80 \text{ crores}) = \text{₹} 3.6 \text{ lakhs}$
Second Part: However, the cost of procuring the spare now is ₹ 10 lakh.
Therefore, expected cost of downtime is less than the cost of spare; hence the spare need not be bought along with the equipment.
- (b) (i) $(\text{Actual achievement in effective work done}) / (\text{Ideal or basic standard target of achievement}) \times 100$
(ii) $(\text{Total Throughput Time}) / (\text{Value Added Time})$ Or,
[Return per factory hr./Cost per factory hr.]
(iii) $(\text{Number of Break-downs per week}) / (\text{Available Machine Hours per week})$
- (c) Benefits of Benchmarking
(i) Benchmarking is particularly helpful in validating proposals for change.
(ii) Benchmarking often results in creative imitation and the adoption of new practices that overcome previous industry barriers.
(iii) This search for diversity and for innovative breakthroughs applied elsewhere is at the core of benchmarking benefits.
(iv) By sharing information, all parties benefit, because it is difficult to excel in all activates.
(v) Sharing information and data is often the first hurdle to be overcome in the Benchmarking process.
(vi) Do not, however, attempt benchmarking in areas in which trade secrets or sensitive information determines the outcome of the process.
(vii) Benchmarking, used in conjunction with other quality techniques or used alone, can influence how an organization operates.

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- (viii) If the search for "Best", or just "Better" practices is performed correctly, then the likelihood of successful outcome is quite high.
(ix) Success however, assumes that pitfalls are avoided and prerequisites have been met before Benchmarking is initiated.

3. (a) Expand the following:

1×3 = 3

- (i) JIT, (ii) CBA and (iii) TPM
(b) Compute the productivity per machine hour with the following data. Also draw your interpretation.

Month	No. of machines employed	Working hours	Production Units
January	400	220	99,000
February	550	180	1,00,000
March	580	220	1,25,000

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(c) List the various steps in Maintenance Planning.

Answer II. 3:

- (a) (i) JIT: Just – in – Time (ii) CBA : Cost Benefit Analysis (iii) TPM: Total Productive Maintenance
(b)

Month	No. of machines employed	Working hours	Machine hours	Production units
January	400	220	88,000	99,000
February	550	180	99,000	1,00,000
March	580	220	1,27,600	1,25,000

P = Productivity per machine hour

= Number of units produced /Machine hours

For January $P = 99,000/88,000 = 1.125$

February $P = 100,000 / 99,000 = 1.010$

March $P = 125,000 / 127,600 = 0.980$

Interpretation: Though the total production in number of units is increasing, the productivity is declining.

(c) Steps in Maintenance Planning:

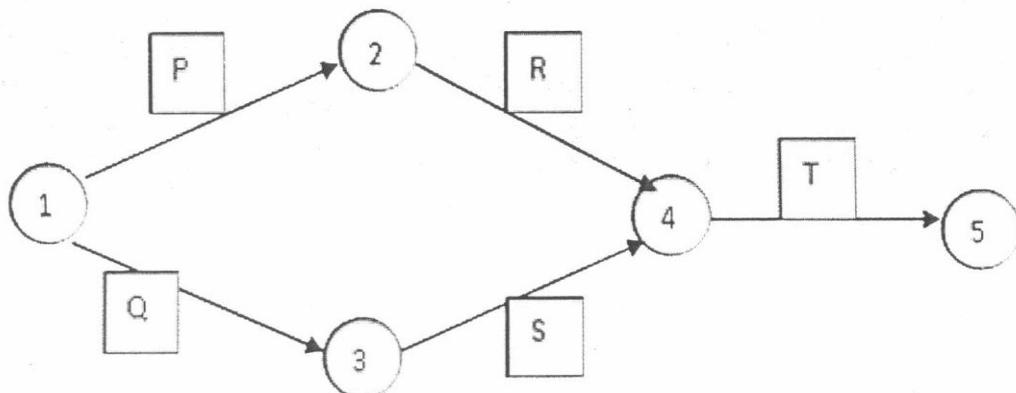
- (i) To know the equipment to be maintained, available technique for maintenance and the facilities available to carry out maintenance work.
- (ii) To establish the priorities of maintenance activities by categorising the activities as emergency work, priority work and non-priority work.
- (iii) To investigate the maintenance work to be done at the workstation to ascertain physical access and space limitations, facilities for lifting and handling (moving), facilities for disposal of water, oil, gas and other hazardous materials, space for keeping the dismantled parts etc.
- (iv) To develop the repair plan on the basis of
 - (a) Recommendation of original equipment manufacturer;
 - (b) Technical experience;
 - (c) Equipment history and

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- (d) Management decision for a new technique of maintenance work.
- (v) To prepare a list of maintenance materials and spare parts required.
- (vi) To prepare a list of special tools and special facilities such as material handling equipments (such as crane) required.
- (vii) To estimate the time required to do the maintenance work.
- (viii) To provide for necessary safety devices and safety instructions.
4. (a) A project consists of five activities. Activities P and Q run simultaneously. The relationship among the various activities is as follows: 4
- | Activity | Immediate Successor |
|----------|---------------------|
| P | R |
| Q | S |
- Activity T is the last operation of the project and it is also immediate successor to R and S. Draw the network of the Project.
- (b) Define Motion Study.
The principles of motion economy are divided into three groups'. List the three groups. 2+3 = 5
- (c) Calculate the standard production per shift of 8 hours duration, with the following data: Observed time per unit = 5 minutes, Rating Factor -120%, Total allowances = 30% of normal time. 6

Answer II. 4:

(a)



- (b) Motion study is the science of eliminating wastefulness resulting from using unnecessary; ill-directed and inefficient motion. The aim of motion study is to find and perpetuate the scheme of least waste methods of labour.

The principles of motion economy are divided into three groups, viz.

- (i) Effective use of the operator
- (ii) Arrangement of the workplace
- (iii) Tools and equipment

- (c) Normal time per unit = Observed time / unit × Rating factor
 $= 5 \times (120/100) = 6\text{minutes}$

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Allowances = 30% of normal time : $(30 \times 6)/100 = 1.8$ minutes

$$\begin{aligned}\text{Standard time/unit} &= \text{Normal time/unit} + \text{Allowances} \\ &= 6 + 1.8 = 7.8 \text{ minutes / unit}\end{aligned}$$

Standard production in shift of 8 hours

$$= (8 \times 60) / 7.8 = 61.54 \text{ units.}$$

Section C

II. Answer any two questions: $15 \times 2 = 30$

1. (a) Distinguish between open and closed systems with examples. 4
- (b) "Many persons are involved in the design, use, and maintenance of a large database. We call them the 'actors on the scene' and 'workers behind the scene'." List the categories of persons/ professionals involved in the database with one sentence against each category to describe the responsibility attached to it. 8
- (c) From the following two relations of X and Y, find $X \cap Y$: 3

Relation X	
Batch No.	Course
010	BCOM
011	MCOM
012	BA
013	MA
014	BSC
015	MSC

Relation Y	
Batch No.	Course
011	MCOM
013	MA
015	MSC
020	LLB
025	PHD
030	MBBS

Answer II. 1:

- (a) Distinction between open and closed systems:

Open Systems: Open systems actively interact with their environment. Such systems regularly get inputs and give outputs to its environment. Open systems are also able to adapt to environmental changes for their survival and growth. Business organization is an example of such system. Marketing System is an open system. The system takes inputs/feedbacks and gives outputs to its environment by way of giving products of the company and also creates new customers.

Closed Systems: A closed system is self-contained and does not interact or make exchange across its boundaries with its environment. Closed systems do not get the feedback they need from the external environment and tend to deteriorate eventually. For example, if a marketing system does not get feedback from the market, its

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efficiency will gradually continue to decrease. It is not subject to disturbances from its environment. A computer program can be taken as an example of relatively closed system because, it accepts only previously defined inputs, processes them and provides previously defined outputs and it does not change with the change in environment.

- (b) The categories of persons / professionals involved in the database are listed below:

Actors on the scene

- (i) Database Administrators: 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.
- (ii) Database Designers: Database designers are responsible for identifying the data to be stored in the database and for choosing appropriate structures to represent and store such data.
- (iii) End Users: End users are the people whose jobs require access to the database for querying, updating, and generating reports, viz. Casual End Users, Naive or Parametric End Users, Sophisticated End Users, and Stand Alone Users.
- (iv) System Analysts: System Analysts determine the requirements of end users, especially naive and parametric end users, and develop specifications for canned transactions that meet these requirements.
- (v) Application Programmers: Application programmers implement these specifications as programs, test, debug, document and maintain these canned transactions.

Workers behind the Scene

- (vi) DBMS system designers and implementers: DBMS system designers and implementers are persons who design and implement the DBMS modules and interfaces as a software package.
- (vii) Tool developers: Tool developers include persons who design and implement Tools — the software packages that facilitate database system design and use, and help improve performance.
- (viii) Operators and maintenance personnel: Operators and maintenance personnel are the system administration personnel who are responsible for the actual running and maintenance of the hardware and software environment for the database system

(c)

XNY	
Batch No.	Course
011	MCOM
013	MA
015	MSC

2. (a) State the main reasons for the spread of E-commerce. 6
(b) State the advantages of using pre-written application packages. 4
(c) List the various phases in implementing BPR and explain each phase in one sentence only. 5

Answer II. 2:

- (a) Main Reasons for the Spread of E-commerce:
(i) Digital convergence, i.e., it means that due to digital revolution almost all digital devices can communicate with one another.

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- (ii) Today's E-commerce is available to anyone, anywhere in the world, anytime 24×7 (24 hours a day, 7 days a week).
(iii) It helps in bringing about positive changes in an organization.
(iv) People are now having a widespread access to IT and Personal Computers (PCs).
(v) E-commerce helps in reducing operating costs and increasing profit margins due to global operations.
(vi) Demand for customized products and services is increasing.
- (b) The advantages of using pre-written application packages are summarized below:
- (i) **Rapid implementation:** Just after purchasing, application packages are readily available but software developed in-house may take months or even years.
 - (ii) **Low risk:** Organizations know the cost and its price as the application package is available in finished condition. With in-house developed software, there is an uncertainty with regard to both the quality of the final product and its final cost.
 - (iii) **Quality:** Due to high expertise of the firms engaged in application package developments, it can provide better software. In contrast, in-house programmers often have to work over a wide range of application areas and they may not be possessing expertise for undertaking proposed software development.
 - (iv) **Cost:** A pre-written application package generally costs less than an in-house developed package. In addition, many hidden costs are faced by organisations who want to develop applications in-house.
- (c) Implementation phases of BPR (Business Process Re-engineering):
- (i) Project kick off: Project goal, project team and communication standards are agreed upon.
 - (ii) Process identification and data gathering: "As is" processes are assembled through flow charts and analysed to identify major and strategic business processes to be re-engineered.
 - (iii) Process Re-engineering: Non-value adding activities and excess control are identified, checked with customer value as a focal point, impact of new technologies on process improvement evaluated, and Workflow Automation and ERP etc. envisaged.
 - (iv) Blueprint of new system: Blueprinting involves modeling workflow and information requirement, of new business processes.
 - (v) Transformation: A migration strategy and a migration plan of transformation are adopted to establish new organizational structure, detailed training and reallocation of workforce, and cut off dates for implementation.
3. (a) 'OLTP are being adopted in wider scale to have certain advantages'. List three major advantages. 3
- (b) Fill in the blanks in the context of relational database management system: $1 \times 4 = 4$
- (i) In a formal relational model, a row is called a _____.
 - (ii) A _____ header is called an attribute.
 - (iii) The data type describing the types of values, appearing in each column, is called a _____.
 - (iv) RDBMS supports a _____ structure for the data with enforced relationship between the _____.
- (c) State two distinctive features of each of the following terminologies used in a business situation:
- (i) Management Information System, (ii) Decision Support System, (iii) Executive

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Information System and (iv) Expert System.

$2 \times 4 = 8$

Answer II. 3:

- (a) OLTP are being adopted in wider scale to have the following three major advantages:
- (i) It can serve multiple users at a point of time
 - (ii) Technology serves the facilities to collect information from multi-locations
 - (iii) High flexibility in information processing.
- (b) (i) Tuple, (ii) Column, (iii) Domain, (iv) Tabular, Tables.
- (c) Two distinctive features of each of the following terms are mentioned below:
- (i) Management Information System:
 - (A) It meets information requirement at different levels with pre-defined reports.
 - (B) It supports routine decision making.
 - (ii) Decision Support System:
 - (A) It is based on one or more corporate databases.
 - (B) It is used for solution in a complex business situation.
 - (iii) Executive Information System:
 - (A) It aims at providing information to top executives of an organization who are involved in strategic decision making.
 - (B) It is an advanced model of Decision Support System which can take care of unstructured problem situation.
 - (iv) Expert System:
 - (A) It is a knowledge based system which acts as an expert in devising solutions.
 - (B) It operates on previous experience which is stored in a database.