INTERMEDIATE EXAMINATION
GROUP II
(SYLLABUS 2012)

SUGGESTED ANSWERS TO QUESTIONS
JUNE 2017

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.
This paper contains 3 sections.
All Sections are compulsory, subject to instructions provided in each Section.
All workings must form part of your answer.
Assumptions, if any, must be clearly indicated.
Working Notes should form part of the answer.

Section A

There are four questions in this Section, which are compulsory.

1. Answer any five of the following questions: 2×5=10

(a) Define the 'Run Time' in batch production.
(b) What is Route Sheet in Production Planning Function?
(c) Write down the formula for Planned Capacity.
(d) Mention the different phases in Project Life Cycle.
(e) What do you mean by the term "Total" in "Total Production Maintenance"?
(f) Provide the definition of Domain in Relational Database Management System.
(g) How can you identify a 'bottleneck' in a process?
(h) Mention some of the modules of master data in an ERP system.

Answer 1:

(a) Run time is the time required to produce a batch of parts. This is calculated by multiplying the time required to produce each unit by the batch size.

(b) A route sheet is a document providing information and instructions for converting the raw materials into finished parts or products. It defines each step of the production operation and lays down the precise path or route through which the product will flow during the conversion process.

(c) Planned capacity = Designed capacity × Efficiency × Utilization factor

(d) Mention the different phases in Project Life Cycle.
The main phases in Project Life Cycle are as follows:
1. Conception phase, 2. Definition phase, 3. Planning and organising phase 4. Implementation phase, and 5. Project clean-up phase

(e) Total in "Total Production Maintenance" means:
(i) Total employee involvement,
(ii) Total equipment effectiveness (i.e., Zero breakdown) and

(iii) Total maintenance delivery system.

(f) Provide the definition of Domain in Relational Database Management System.. The data type describing the types of values, appearing in each column is called a domain.

(g) A bottleneck can be identified by determining points at which excessive amounts of work-in-process inventories are accumulated.

(h) ERP packages contain several modules, such as finance, sales and distribution, materials management, manufacturing and production control, human resources, plant maintenance and quality management.

2. Match List A with List B: 1×5= 5

List A	List B
(a) Operating System in an organisation	**(i) to deliver a product or service that satisfies a customer**
(b) Resistance to Change	**(ii) Not limited to Internal data only, access to external sources of data is also provided**
(c) Digital Signature	**(iii) Some of the employees may be unwilling to adopt a new way of working**
(d) Quality	**(iv) Configuration of resources combined for the provision of goods or services**
(e) EIS	**(v) Authentication of electronic record**

Answer: 2

List A	List B
(a) Operating System in an organisation	(iv) Configuration of resources combined for the provision of goods or services
(b) Resistance to Change	(iii) Some of the employees may be unwilling to adopt a new way of working
(c) Digital Signature	(v) Authentication of electronic record
(d) Quality	(i) to deliver a product or service that satisfies a customer
(e) EIS	(ii) Not limited to Internal data only, access to external sources of data is also provided

3. State whether following statements are 'True' or 'False': 1×5=5

(a) Industrial engineering is not concerned with scheduling, performance standards, work methods, quality control and material handling.

(b) Database manipulation, involves querying and updating.

(c) Greater safety for workers, reduced production downtime and fewer repetitive repairs are some of the benefits of preventive maintenance.

(d) ERP confines to manufacturing only and does not cover any other aspect of organization.

(e) With the help of flowchart, problem cannot be analysed in an effective way.

Answer: 3

(a) False
(b) True
(c) True
(d) False
(e) False

4. Fill in the blanks: 1×5=5

(a) _____ consists of the buying and selling of products or services over electronic systems such as the internet and other computer networks.

(b) The effectiveness of maintenance can be evaluated in terms of maintenance costs incurred, equipment _____etc.

(c) The _____is the use of the English language with the syntax of structured programming.

(d) The characteristic that allows program-data independence and program-operation independence is called_____.

(e) The _____control system assigns materials, labour and overhead costs to production jobs or products.

Answer: 4

(a) Electronic commerce, or E-commerce or E-business
(b) Downtime
(c) Structured English or Program Design Language (PDL) or Pseudo Code
(d) Data Abstraction
(e) Work-In-Process

Section B

There are *four* questions in this Section. Answer *any three* questions. 15×3=45

5. (a) A department of a company has to process a large number of components/month. The process equipment time required is 42 minutes/component, whereas the requirement of an important process chemical is 1.8 litres/component. The manual skilled manpower required is 18 minutes/component for polishing and cleaning. The following additional data are available:

	Availability/month	Efficiency of utilization
Equipment hour	600	90%
Imported Chemicals - Litres	1200	98%
Skilled manpower - Hours	300	70%

(i) What is the maximum possible production under the current conditions?
(ii) (ii) If skilled manpower availability is increased by overtime by 25%, what will be the impact on production increase? 6+2=8

(b) A firm is using a machine whose purchase price is ₹12,000. The installation charges amount to ₹3,500, and the machine has a scrap value of only ₹1,500 because the firm has a monopoly of this type of work. The maintenance cost in various years is given in the following table.

Year	1	2	3	4	5	6	7	8	9
Cost (*)	260	760	1200	1800	2500	3200	4100	5000	6500

The firm wants to determine after how many years should the machine be replaced on economic considerations, assuming that the machine replacement can be done only at the year ends. 7

Answer: 5

(a)

(1) Actual Equipment Hrs. used = 600 × 90/100 = 540 Hrs.
Possible output = 540 × (60/42) = 771 Components

(2) Imported chemicals = 1,200 × 98/100 = 1176 litres, actually used;
Possible output = 1176/1.8 = 653 Components

(3) Skilled manpower Hrs. used = 300 × 70/100 = 210 Hrs.
Possible output =210 × (60/18) = 700 Components
The bottle-neck capacity = 653 Components.

(i) Maximum possible production under the given conditions = 653 Components.

(ii) There will be no impact on production increase if skilled manpower is increased by overtime by 25% as the bottle-neck in output is equipment hours.

(b) Cost of machine, (C) = ₹ 12,000 + ₹ 3,500 = ₹ 15,500
Scrap value, (S) = ₹ 1,500
C - S = 15,500-1500 = ₹ 14,000
We can determine the optimal replacement period as in the Table below:

Determination of Optimal'. Replacement Period

Year	Maintenance Cost, Mt	Cum. Main. Cost, ΣMt	Depreciation C- S	Total cost T (n)	A (n)
(i)	(ii)	(iii)	(iv)	(v) = (iii) + (iv)	(vi) = (v) / n
1	260	260	14000	14260	14260
2	760	1020	14000	15020	7510
3	1200	2220	14000	16220	5407
4	1800	4020	14000	18020	4505
5	2500	6520	14000	20520	4104
6	3200	9720	14000	23720	3953*
7	4100	13820	14000	27820	3974
8	5000	18820	14000	32820	4102
9	6500	25320	14000	39320	4369

Here the lowest average cost, A(n), is ₹ 3,953 approximately, which corresponds to n = 6. In the above Table, it is indicated by an asterisk mark,(*). Therefore, the machine may best be replaced every 6 years.

6. (a) A company intends to buy a machine having a capacity to produce 1,50,000 good parts per annum. The machine constitutes a part of the total product line. The system efficiency of the product line is 75%.

(i) Find the system capacity.

(ii) If the time required to produce each part is 120 seconds, and the machine works for 2200 hours per year, and if the utilization of the machine is 65% and the efficiency of the machine is 95%, compute the output of the machine.

(iii) Calculate the no. of machines required. 3×3=9

(b) A project consists of seven activities. Draw the network diagram of this project with the following situations: 6

- **Q is the Pre-requisites for T**
- **R is the Pre-requisites for T & U**
- **S is the Pre-requisites for U**
- **T and U are the Pre-requisites for V**
- **Activity W is the last activity and is the immediate successor to activity V.**

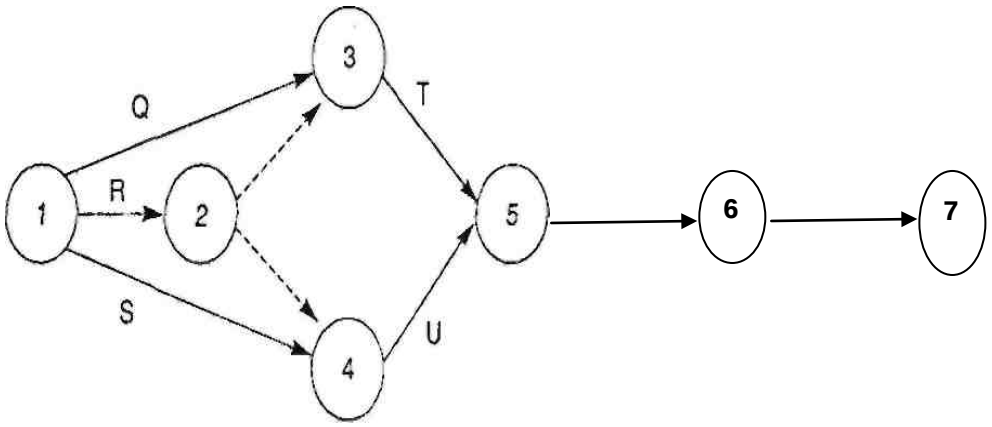
Answer: 6

(a) (i) System capacity = Actual output p.a./System efficiency
= 1,50,000/0.75 = 2,00,000 units/annum
= 2,00,000/2,200 = 91 units/hr

(ii) Output per annum = unit capacity × % utilization x efficiency
Unit capacity = (60 × 60) sec/120 sec per unit = 30 units
Output per hour = 30 × 0.65 × 0.95 = 18.525 = 19 units

(iii) No. of machine required = system capacity /output per hour
= 91/19=4.78=5 machines (As indicated)

(b)



7. (a) The time study of a machinery operation recorded cycle times of 7.5, 8.5, 7.0 and 8.0 minutes. The analyst rated the observed worker as 80%. The firm uses a 0.25 allowance fraction. Compute the Average Cycle time, Normal time and Standard time. 3×3=9

(b) Discuss the main areas requiring maintenance. 6

Answer: 7

(a)

(i) Average cycle time = (7.5 + 8.5 + 7.0 + 8 .0)/4 = 7.75 minutes

(ii) Normal time = 7.75 × 0.8 = 6.2 minutes

(iii) Standard Time = 6.2/(1 - 0.25) = 6.2/0.75 = 8.27 minutes

The standard time for this machinery operation would be set at 8.26 minutes, which is greater than the average cycle time observed. The average cycle time was adjusted for the rating factor (80%) and the allowance fraction (0.25).
(As indicated)

(b) The major areas of maintenance are:

1. **Civil Maintenance**
   Building construction and maintenance, maintaining service facilities such as water, gas, steam, compressed air, heating and ventilating, air conditioning, painting, plumbing and carpentry work. Also included in civil maintenance are janitor, service, house-keeping, scrap disposal, fencing, landscaping, gardening and maintaining drainage, lawns and firefighting equipments.
2. **Mechanical Maintenance**
   Maintaining machines and equipments, transport vehicles, material handling equipments, steam generators, boilers, compressors and furnaces. Lubricating the machines is also part of mechanical maintenance work.
3. **Electrical Maintenance**
   Maintaining electrical equipments such as generators, transformers, switch gears, motors, telephone systems, electrical installations, lighting, fans, meters, gages, instruments, control panels and battery charging.

8. (a) Identify the objectives of Quality Control and also Quality requirements from customer point of view. 2+5=7

(b) Identify the requirement of a good maintenance program. 8

Answer: 8

(a) Objectives of quality control are to provide products/services which are dependable, satisfactory and economical.
Quality requirements from customer point of view:

1. Conformance to specifications (requirements).
2. Value for money
3. Fitness for use.
4. Support provided by seller (customer services)
5. Psychological impression (image, aesthetics)

(b) The requirements of a good maintenance program:

(1) Good supervision and administration of maintenance department.
(2) Consultation with production department personnel before fixing priority schedules for maintenance work.
(3) A good lubrication schedule.
(4) Clear, correct and detailed instruction to maintenance crew regarding maintenance work.
(5) Keeping proper records of maintenance, service manuals, maintenance hand book etc.
(6) Adequate stock of spare parts recommended by equipment manufacturers.
(7) Proper training for maintenance crew.
(8) Adequate space around the machine for ease of maintenance work.
(9) Data regarding failure of machines and the corrective maintenance work carried out earlier.
(10) A systematic approach to maintenance i.e., problem —> cause —> diagnosis —> rectification

Section C

There are three questions in this Section. Answer any two questions. 15×2=30

9. (a) Mention the activities and responsibilities of the following personnel engaged in the Information System Department: 2×4=8

(i) Business Analyst

(ii) Database Administrator

(iii) Information System Manager

(iv) Programmer

(b) Discuss about the role of various categories of End Users of the database. 7

Answer: 9

(a) The activities and responsibilities of the following personnel engaged in the Information System Department:

Designation	Duties and responsibilities
1. Business Analyst	(i) Development of new Information System. (ii) Acting as co-ordinator between users and IS developers
2. Database Administrator	(i) Database Management (ii) Database Library Management (iii) Security of data
3. Information System Manager	(i) Planning the resources and time frame of implementation (ii) Supervising the overall implementation of system and day to day operation
4. Programmer	Development / modification of programs according to systems specifications and design.

(b) End users are the people whose jobs require access to the database for querying, updating, and generating reports; the database primarily exists for their use. There are several categories of end users:

1. Casual end users occasionally access the database, but they may need different information each time. They use a sophisticated database query language to specify their requests and are typically middle- or high-level managers or other occasional browsers.
2. Naive or parametric end users make up a sizable portion of database end users; Their main job function revolves around constantly querying and updating the database, using standard types of queries and updates—called canned transactions—that have been carefully programmed and tested. The tasks that such users perform are varied:
   - Bank tellers check account balances and post withdrawals and deposits.
   - Reservation clerks for airlines, hotels, and car rental companies check availability for a given request and make reservations.
   - Clerks at receiving stations for courier mail enter package identifications via bar codes and descriptive information through buttons to update a central database of received and in-transit packages.
3. Sophisticated end users include engineers, scientists, business analysts, and others who .thoroughly familiarize themselves with the facilities of the DBMS so as to implement their applications to meet their complex requirements.

4. Stand-alone users maintain personal databases by using ready-made program packages that provide easy-to-use menu- or graphics-based interfaces. An example is the user of a tax package that stores a variety of personal financial data for tax purposes.

10. (a) What are the prerequisites of an MIS? 8

(b) What are the various objectives of the Information Technology Act, 2000? 7

Answer: 10

(a) The following are pre-requisites of an effective MIS:

1) Database - The data in database is organised in such a way that access to the data is improved and redundancy is reduced. Such a database is capable of meeting information requirements of its executives, which is necessary for planning, organising and controlling the operations of the business.
2) Qualified System and Management Staff- MIS should be managed by qualified officers. The organizational management base should comprise of two categories of officers (i) System and Computer experts and (ii) Management experts
3) Support of Top Management - A MIS becomes effective only if it receives the full support of top management. To gain the support of top management, the officer should place before them all the supporting facts and state clearly the benefits which will accrue from it to the organization.
4) Control and Maintenance of MIS- Sometimes users develop their own procedures or shortcut methods to use the system, which reduces its effectiveness. Maintenance is closely related to control.

(b)

- To grant legal recognition to transactions carried out through electronic data interchange and other means of electronic communication commonly referred to as "electronic commerce" replacing the paper-based communication;
- To give legal recognition to Digital Signature for authentication of any information or matter which requires authentication under any law;
- To facilitate electronic filing of documents with Government Departments;
- To facilitate electronic data storage;
- To facilitate and give legal sanction to electronic funds transfers between banks and financial institutions;
- To give legal recognition for keeping of books of account by bankers in electronic form;
- To amend the Indian Penal Code, the Indian Evidence Act, 1872; the Banker's Book Evidence Act, 1891 and the Reserve Bank of India Act, 1934.

11. (a) Explain the various critical failure factors in ERP implementation. 8

(b) In the context of MIS, discuss about the points to be considered before determining information requirements of Management. 7

Answer: 11

(a) Critical factors for failure in ERP implementation may be defined as contrary to critical success factors. Some specific concerns of failures are mentioned below:

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

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

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

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

(b) Information Requirement depends on the following factors:

A) Operational Functions
B) Type of Decision Making
C) Level of Management

A) Operational Functions: The information generated in different functions is different and control requirements vary widely. For example, the requirement of information for decision making in production function will not be same as in case of financial function.

B) Type of Decision Making: Decision making type may be (i) programmed decisions and (ii) Non-programmed decisions.

(i) Programmed decision making refers to those decision making process which are based on some standard set of procedure established by the management and according to scientific principle of management. In case of programmed decision making, supporting information sets and reports are standard, well defined and well structured. Naturally decision making process is simple and based on some guidelines. For example, stores ledger summary and material consumption reports may help in decision making on Inventory control.

(ii) Non-programmed decision making refers to those decision making process which does not go by any pre-determined set of guidelines. Normally this type of decision making takes place to handle special business situations with the help of experience, judgement and vision of the decision maker. In case of non-programmed decision making, information are unstructured and external environmental information is a must along with internal information sets. For example, for decision on business policy many non-standard information like technology change, competitors market share etc is required apart from internal information of sales of different products.

C) Level of Management

Information requirement varies with the level of management and purpose. The levels of management in the order of hierarchy are Top Management, Middle Management and Operational Management.

The activities of different levels of management are given below:

Top Management: Top management is concerned with strategic decisions like diversification, technology acquisition, new market exploration, strategic business alliance, takeover, merger etc.

Middle Level: Middle level management is generally involved in tactical decision making with the help of performance analysis, budget variance analysis, devising better productivity mechanism and control etc

Operational Management: Operational Management staffs are mainly involved in scheduling the activities, keeping track of progress of day-to-day operations and decisions of well-structured problems etc.