

Solved  
**Scanner**

**Appendix**

**CMA Inter Gr. II (New Syllabus)**

**(Solution of December - 2014)**

**Paper - 9: Operations Management and Information Systems**

**Paper - 9A: Operations Management**

**Chapter - 1: Operations Management & Designing and Managing Operations  
2014 - Dec [1] (c)**

**New Product Development include following steps:**

- (i) Exploration
- (ii) Screening
- (iii) Business Analysis
- (iv) Development
- (v) Testing
- (vi) Commercialisation

**Chapter - 2: Production Planning**

**2014 - Dec [1] (e), (f)**

**(e) Functions of Production Planning:**

There are four main functions of production planning:

- (i) Estimating
- (ii) Routing
- (iii) Scheduling
- (iv) Loading

**(f) LOB, stands for Line of Balance.**

It is applied in production scheduling and control to determine, at a review date, not only how many of an item should have been completed by that date, but also how many should have passed through the previous (upstream) operation stages (processing steps) by that time so as to ensure the completion of the required delivery schedule.

2014 - Dec [2] (a) (ii), (b) (i), (iii), (c) (i), (ii), (d) (i), (iii)

(a) (ii) **Advantages of Method Study:**

1. Work simplification.
2. Improved working method.
3. Improvement of quality of the products.
4. The improvement of factory, shop and workplace layout.
5. The improvement of the design of plant and equipment.
6. Better working conditions/environment.
7. Better material handling and lesser material handling cost.
8. The improvement of processes and procedures.
9. Improvements in the use of materials, machines and manpower.
10. Less fatigue to operator.
11. Optimum utilization of all resources.
12. Higher safety to workmen.
13. Shorter production cycle time.
14. The improvement of the design of plant and equipment.
15. Economy in human effort and the reduction of unnecessary fatigue.
16. Higher job satisfaction for workmen.
17. The development of a better physical working environment.
18. Reduced material consumption and wastages.
19. Reduced manufacturing cost and higher productivity.

(b) (i) (Amount in Lakh)

Units	Location A			Location B			Location C		
	F.C.	V.C.	T.C.	F.C.	V.C.	T.C.	F.C.	V.C.	T.C.
5000	35	17.5	52.5	55	12.5	67.5	30	20	50
10000	35	35.0	70.0	55	25.0	80.0	30	40	70
15000	35	52.5	87.5	55	37.5	92.5	30	60	90
20000	35	70.0	105.0	55	50.0	105.0	30	80	110
22000	35	77.0	112.0	55	55.0	110.0	30	88	118
25000	35	87.5	122.5	55	62.5	117.5	30	100	130

- (A) Up to 10000 units most suitable location is **Location C**.  
 Between 10000 to 20000 units most suitable location is **Location A**.  
 Above 20000 units most suitable location is **Location B**.
- (B) At a volume of production/sales of 22000 **Location B** is best to choose as it has least cost ₹ 110 lakh.

(iii) **Methods of finding the optimal solution for a given linear programming problems:**

1. **Graphic method:** Linear programming which involves two or three variables can be solved graphically.  
Any feasible solution which maximises or minimises the objective function is optimal feasible solution.
2. **Simplex Method:** Any problem can be solved by this method which satisfies the conditions of linearity and certainty irrespective of the number of variables.  
In case of simplex method optimal solution is reached when net evaluation row contains either zeros or positive values in case of minimisation problem.  
And in case of simplex method optimal solution is reached when net evaluation row contains either zeros or negative values in case of maximisation problem.

**Non-negatively condition:** The linear inequalities  $x \geq 0$  and  $y \geq 0$ .

These are included because  $x$  and  $y$  are usually the number of items produced and you cannot produce a negative number of items, the smallest number of items you could produce is zero.

(c) (i) **Classification of Production Planning and Control Functions:**

The functions of Production Planning and Control can be classified under the following:

- **Materials:** Raw materials, spare parts and components which must be available in the correct quantities and specifications at the right time.
- **Methods:** Choosing the best method from several alternatives. It involves deciding the best sequence of operations for manufacturing the parts, building up subassemblies and major assemblies which in turn will make up the finished product, within the limitations of existing layout and workflow.
- **Machines and Equipments:** Production processes or methods have a relationship to the production facilities (machines and equipments) available. PPC is concerned with selection of machines and equipments and also with maintenance policy, procedure and schedules, replacement policy and tooling. (Design and manufacture of tools).

- **Routing:** Routing prescribes the flow of work in the plant and is related to consideration of layout of temporary storage locations for raw materials, components and semi processed parts, and of material handling systems. Routing is a basic PPC function.
- **Estimating:** The processing times (both set up time and operation time per piece) required for the parts to be manufactured in-house are estimated and the standard time (both machine time and labour time) are established as performance standards.
- **Loading and Scheduling:** Machines have to be loaded according to their capacity and capability. Machine loading is carried out in conjunction with routing (as indicated in process layouts or operations analysis and routing sheets) to ensure smooth workflow and the prescribed feeds, speeds of machines are adhered to as well as the estimated time (standard time which is the allowed time to do a job).
- **Scheduling:** Determines the utilisation of equipment and manpower and hence the efficiency of the plant. Scheduling determines the starting time and completion time for each and every operation for each and every part to be manufactured and sub-unit to be assembled so that the finish product is ready to be shipped to the customer as per the predetermined delivery schedules.
- **Dispatching:** This is concerned with the execution of planning functions. Production orders and instructions are released according to the schedule, sequences indicated in route sheets, and machine loading schedules are adhered to an authorisation is given for release of materials and tools to the operators to carryout the work.
- **Expediting or Progressing:** This means follow-up or keeping track of the progress made in completing the production as per schedules. This follows dispatching function logically. Dispatching initiates action on the shop floors whereas expediting ensures that the schedules are adhered to. It keeps a close liaison with the manufacturing work centres to provide a feed back to the PPC manager for prompt review of targets and schedules.
- **Inspection:** This function relates to checking the quality in production and of evaluating the efficiency of the processes, methods and workers so that improvements can be made to achieve the desired level of quality.

- **Evaluating or Controlling:** The objective of evaluation or controlling is to improve performance. Methods and facilities are evaluated to improve their performance. To sum up, we can state that PPC is a management tool, employed for the direction of the manufacturing operations and their co-ordination with other activities of the firm. In the production system, which is primarily defined by the dimensions of quantity, quality, time and price, the functions of PPC comprise.
- (ii) (A) The times for element no. 2 in cycle 2 and for element no. 5 in cycle 3 are suspect and should be disregarded as they vary very much as compared with time values for these elements in other cycles.
- (B) The basic time or normal time is calculated on the basis of data excluding the outliers as below:

Element	Mean actual time (minutes)	Performance rating (%)	Normal or basic time (minutes)
1	1.3	85	$\frac{1.3 \times 85}{100} = 1.105$
2	0.94	95	$\frac{0.940 \times 95}{100} = 0.893$
3	1.902	100	$\frac{1.902 \times 100}{100} = 1.902$
4	2.29	120	$\frac{2.290 \times 120}{100} = 2.748$
5	1.312	100	$\frac{1.312 \times 100}{100} = 1.312$

Normal time for the total job which include all five elements = 7.96 minutes

#### Calculation of standard time

Standard time for the job = Normal time + Allowances

$$= 7.96 + \frac{13}{100} \times 7.96 + \frac{4}{100} \times 7.96$$

$$= 7.96 + 1.035 + 0.318 = 9.313 \text{ minutes}$$

If 25% incentive allowance is given, total time allowed under incentive scheme

$$= 9.313 + \frac{25}{100} \times 9.313$$

$$= 9.313 + 2.328 = 11.641 \text{ minutes}$$

**(d) (i) Managerial Considerations in Scheduling**

Scheduling is essentially the short-term execution plan of a production planning model. Production scheduling consists of the activities performed in a manufacturing company in order to manage and control the execution of a production process. A schedule is an assignment problem that describes into details (in terms of minutes or seconds) which activities must be performed and how the factory's resources should be utilized to satisfy the plan. In all these scheduling tasks, different criteria may be used in deciding which of several schedules are best. Criteria could be ranked from applying simple rules to determine which job has to be processed next at which work-centre or to the use of advanced optimizing methods that try to maximize the performance of the given environment.

Those criteria may relate to the amount of time the machine or equipment might idle, the.

In general there are six criteria that may be used in evaluating different possible schedules. They are:

- (i) Providing the product or service when the customer wants it.
- (ii) Minimising the length of time taken to produce that product or service.
- (iii) Minimising the level of work-in-progress (WIP) inventories.
- (iv) Minimising the amount of idle time of equipment or machine.
- (v) Minimising the amount of idle time of employees; and
- (vi) Minimising costs.

**(iii) Calculation of machine down time:**

Request Arrival time	Repair time reqd. with one person Hours	Repair time begins (clock time)	Repair time ends (clock time)	Machine down time (Hours)		
				Waiting time	Repair time	Total time
0.00	1.0	0.00	1.00	Nil	1.0	1.0
0.30	1.0	1.00	2.00	0.5	1.0	1.5
2.00	1.5	2.00	3.30	Nil	1.5	1.5

3.00	1.5	3.30	5.00	0.5	1.5	2.0
6.30	0.5	6.30	7.00	Nil	0.5	0.5
<b>Total</b>	<b>5.5 hours</b>			<b>1.0</b>	<b>5.5</b>	<b>6.5</b>

Idle time for the maintenance person = 8 - 5.5 = 2.5 hrs.

(a) Idle time cost for maintenance crew = 2.5 × 150 = ₹ 375

(b) Delay time or waiting time = 1.0 hour

Delay time cost for the machinery = 1.0 × 500 = ₹ 500

### Chapter - 3: Productivity Management and Total Quality Management

2014 - Dec [1] (b), (d)

(b) Input efficiency = Actual consumption/ Desired or standard consumption

Effectiveness = Target achieved/Target achievable

(d) Productivity = Efficiency × Utilisation

Efficiency =  $\frac{\text{Standard time allowed}}{\text{Actual hours used}}$

$$= \frac{6}{7} \times 100 = 85.7\%$$

Utilisation =  $\frac{\text{Actual time worked}}{\text{Hours available}}$

$$= \frac{7}{11} \times 100 = 63.63\%$$

Productivity = Efficiency × Utilisation

$$= 85.7\% \times 63.63 = 54.53\%$$

2014 - Dec [2] (a) (iii), (d) (ii)

(a) (iii) The **technological innovation system** is a concept developed within the scientific field of innovation studies which serves to explain the nature and rate of technological change.

#### Generic components of technological innovation

Four generic components of technological innovation are as follows:

1. **Basic research:** It is research for the advancement of scientific knowledge that has no specific commercial uses.
2. **Applied research:** It is research for the advancement of scientific knowledge that has specific potential commercial uses.
3. **Development:** It is technical activity concerned with translating basic or applied research results into products or processes.

4. **Implementation:** It is activity concerned with designing and building pilot models, equipment, and facilities, and initiating the marketing channels for products or services emerging from research and development.

**(d) (ii) The Eight Most Common Benchmarking Errors are:**

1. **Lack of self-knowledge,** unless you've thoroughly analysed your own operations, your benchmarking efforts will not pay off. You have to know how things work in your company, how effective your current processes are, and what factor are critical. That's why internal benchmarking is an important first step.
2. **Benchmarking everything:** Be selective. Benchmarking another company's employee food service will usually not be worth the time, energy and cost. Your TQM effort as a whole will point out the areas where benchmarking is most likely to pay off.
3. **Benchmarking projects** are broad instead of focused. The more specific the project, the easier it is and the more likely it will generate useful ideas. Benchmark a successful company's hiring procedures, not their entire human resources operations. Focus on accounts receivable handling, not the accounting department as a whole.
4. **Benchmarking produces reports,** not action. Studies have indicated that 50% of benchmarking projects result in no specific changes. The process is not an academic exercise. It should be geared toward generating and implementing actual changes.
5. **Benchmarking is not continuous:** Benchmarking is a process. Even before you reach the benchmark you've set, you should take another look at your partner's performance, or at other companies. New goals should be established and new techniques adopted. The process never ends.
6. **Setting Too Many Goals:** When you start setting goals, you may see many things that you want to accomplish. So, you start setting goals in all areas. The problem with this is that you have a fixed amount time and energy. If you try to focus on many different goals at once, you can't give individual goals the attention they deserve.
7. **Participants are not motivated:** Make sure benchmarking team members have the time to do the job. Even if the project is simply added on their regular jobs, make sure each has a stake in the success of the project. Don't consider benchmarking as "busy work" to be assigned to a group of low level employees.



8. **Too much data:** Actions are what's important, not information for its own sake. Don't measure benchmarking success by quantity of information. Always focus on key issues.

#### Chapter - 4: Economics of Maintenance and Spares Management

2014 - Dec [1] (a)

**Regular Spares:** There are the spares which are required in large quantity at more or less periodical interval as and when the break downs occur.

**Insurance Spares:** Insurance spares are irregularly consumed spares. These are of high value and are not required for routine maintenance but would cause a lengthy shut-down of vital equipment or the entire plant in case they are not available besides would cause high stock out cost.

2014 - Dec [2] (a) (i), (b) (iii)

(a) (i)

	Maintenance	Cum.			
Year	Cost, $M_t$	Cost, $\Sigma M_t$	C-S	T(n)	A(n)
(i)	(ii)	(iii)	(iv)	(v) = (iii)+(iv)	(vi) = (v)/n
1	1200	1200	5000	6200	6200
2	1400	2600	9000	11600	5800*
3	1800	4400	14000	18400	6133
4	2600	7000	18000	25000	6250
5	3200	10200	22000	32200	6440
6	4100	14300	27000	41300	6883
7	5200	19500	33000	52500	7357

Where:

C — Purchase price of machine

S — Scrap Value of machine at the end of n years

\*Here minimum A(n) — ₹ 5800, for n = 2 . The machine should, therefore, be replaced every two years.

(b) (ii) **Preventive Maintenance:** Preventive Maintenance is a daily maintenance (cleaning, inspection, oiling and re-tightening ), design to retain the healthy condition of equipment and prevent failure through the prevention of deterioration, periodic inspection or equipment condition diagnosis, to measure deterioration. Just like human life is extended by preventive medicine, the equipment service life can be prolonged by doing preventive maintenance.

**Breakdown maintenance:** Breakdown maintenance is when the organization only conducts maintenance on a piece of equipment when the equipment breaks down.

A better maxim goes "An ounce of prevention is worth a pound of cure". Sorry, if anybody wait until the equipment breaks down, he pays for lost production, higher parts cost, overtime and all associated "collateral damage".

If the criticality and consequence of failure is high then failure is unacceptable and must be prevented. If a critical component on an airplane fails at 40,000 ft the consequence of failure is extremely high and the collateral damage is unacceptable, so scheduled maintenance must be performed.

Breakdown maintenance is not only disruptive to your operations, but surveys indicate breakdown repairs cost three times the cost of a comprehensive preventative maintenance program. **My strong suggestion is to go for preventive maintenance.**

<b>Paper - 9B: Information Systems</b>
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**Chapter - 1: Information System Analysis and Design**

**2014 - Dec [1] (h)**

**CASE** stands for Computer Aided Software Engineering.

**Classic CASE tools** : established software development support tools (e.g. interactive debuggers, compilers, etc.)

**Real CASE tools:** can be separated into three different categories, depending on where in the development process they are most involved in:

- (i) **Layout form and Screen Generator:** They are for printed report used to format or paint the desired layouts.
- (ii) **Menu Generator:** Menu generator outlines the functions.
- (iii) **Report Generator:** It indicate totals, paging, sequencing and control breaks in creating samples of the desired report.
- (iv) **Code Generator:** It allows the analyst to generate modular units of source code.

2014 - Dec [3] (a) (i), (b) (iii)

(a) (i) **Important factors which should be considered while designing the user outputs:**

These are the important factors which should be considered by the system analyst while designing user outputs.

- (a) **Content:** Only the required information should be included in various outputs because too much content can cause managers to waste time in selecting the information that they need. For example the contents of a weekly report of a sales manager might consist of sales persons and the amount of each product sold by each sales person.
- (b) **Form:** Content can be presented in various forms-quantitative, non-quantitative, text, graphics, video and audio many managers prefer summary information in chart form such as pie chart, line chart, bar chart.
- (c) **Output volume:** It is better to use high-speed printer which are fast in case the volume is heavy.
- (d) **Timeliness:** Some outputs are required on a regular, periodic basis - perhaps daily, weekly, monthly, at the end of a quarter or annually.
- (e) **Media:** A variety of output media are available in the market are- video display, microfilm, magnetic tape/disk and voice output.
- (f) **Format:** The manner in which data are physically arranged is referred to as format.

(b) (iii) **Flowcharts are divided into four major categories:**

1. **Document flowchart:** showing a document - flow through systems.
2. **Data flowchart:** showing data flows in a system.
3. **System flowchart:** showing controls at a physical or resource level.
4. **Program flowchart:** showing the controls in a program in a system.

**Benefits of Flowchart**

- It provides an easy way of communication because any other person besides the programmer can understand the way they are represented.
- It represents the data flow.
- It provides a clear overview of the entire program, problem and solution.
- It checks the accuracy in logic flow.
- It documents the steps followed in an algorithm.
- It provides the facility for coding.
- It provides the way of modification of running program.
- They show all major elements and their relationship.

**Limitations of Using Flowcharts**

- a. Flow charts consume time and it is laborious to draw with proper symbols. Even though it is easy to draw a flow chart for small problems, but when it comes to draw flow charts for complex problems it becomes tedious.
- b. If alterations are required, the flowchart may require redrawing completely.
- c. As the flowchart symbols cannot be typed, reproduction of flowchart becomes a problem.

**Chapter - 2: Database Management System**

2014 - Dec [1] (g)

**Two types of data independence in the three-schema architecture under Data Base Management System are:**

1. **Logical data independence:** It is the capacity to change the conceptual schema without having to change external schemas or application programs.
2. **Physical data independence:** It is the capacity to change the internal schema without having to change the conceptual (or external) schemas. Changes to the internal schema may be needed because some physical files had to be reorganized.

2014 - Dec [3] (b) (ii), (c) (iii)

(b) (ii)

X-Y

UID	Occupation
A15	Student
A25	Student
A38	Business

(c) (iii)

- **Tuple:** A tuple is a data structure that has a specific number and sequence of element.
- **Attribute:** An attribute represents some property of interest that further describes an entity, such as the employee's name or salary.
- **Domain:** The domain of a database attribute is the set of all allowable values that attribute may assume.
- **Graphical User Interface:** A Graphical User Interface (GUI) typically displays a schema to the user in diagrammatic form.
- **Backup utility:** A backup utility creates a backup copy of the database, usually by dumping the entire database onto tape.

**Chapter - 3: Management Information System & Information Economics  
2014 - Dec [1] (j)**

An **information model** in software engineering is a representation of concepts and the relationships, constraints, rules and operations to specify data semantics for a chosen domain of discourse. Typically it specifies relations between kinds of things, but may also include relations with individual things. It can provide sharable, stable and organized structure of information requirements or knowledge for the domain context.

**2014 - Dec [3] (b) (i), (c) (ii)**

**(b) (i) Executive Information System :** Executive Information System is a computer based system that serves the information that is needed by the various top executives. It provides very rapid access to the timely information and also offers the direct access to the different management reports.

**Following are the special features of an EIS:**

- a. EIS provides immediate and easy access to information reflecting the key success factors the company and of its units.
- b. A User-seductive interface, presenting information through color graphics or video, allow an EIS user to grasp trends at a glance.
- c. EIS provides access to a variety of databases, both internal and external, through a uniform interface.
- d. It is not limited to internal data only. Access to external sources of data is also provided.
- e. Both current status and projections should be available from EIS.
- f. An EIS should allow easy tailoring to the preferences of the particular users or group of users.
- g. It is a comprehensive information system and work in conjunction with DSS.

**(c)(ii) Pre-requisites of an MIS:**

1. **Analytical study on information requirement:** A joint effort by system experts and management experts is required to understand the exact need on information at different levels of information and how to assimilate them from data flow from different sources.
2. **Determine the sources of information:** Once the first step is understood, it is to see how to get the required information and their sources.

3. **Establishment of right kind of data processing environment:** The important step involved in MIS designing is arranging the right kind of tools for processing i.e. Computer system and infrastructure in terms of software and skilled manpower.
4. **Selection of software:** To make successful MIS software must be compatible of hardware, capable of taking load of data volume, capable of supporting the communication network.
5. **Database design:** Data base is consolidation of many files, which contain the data of the organisation. The data in a database is organized in such way that access to the data is improved and data redundancy is reduced. It also increases the data integrity.
6. **Support of top management:** For MIS to be effective it should be assured that the resources involved in computer based information system are large and growing larger and larger in view of the importance of technology in the present context. To get these resources for implementing the MIS, the support of top management is essential.
7. **Control of MIS:** Control of MIS means the operation of the system as it was designed to operate. Sometimes, users develop their own procedure or short cut methods to use the system, which reduces its effectiveness. To check such habits of users, the management at each level in the organisation should devise methods for information control.
8. **Maintenance of MIS:** During the maintenance, systems management will discover needs for improvement in the system.
9. **Evaluation of MIS:** An effective MIS should be capable of meeting the information needs its executives in future as well. To maintain this capability evaluation of MIS and timely action thereof is required.

#### **Chapter - 4: Enterprise Resource Planning**

**2014 - Dec [1] (i)**

**The cost price for standard item is calculated based on:**

- Material cost
- Operation cost
- Subcontracting rate
- Surcharges

**2014 - Dec [3] (a) (ii), (c) (i)**

**(a) (ii) Intangible benefits of ERP system:**

- (i) Integration of information resulting efficiency, transparency and effective MIS.
- (ii) Accurate and faster access to data for timely decisions.
- (iii) Error reduction, accuracy of inventory record.
- (iv) Improved customer service, on time shipment, shorter order to shipment cycle.
- (v) Establishment of standardized procedures. Faster product / service look-up and ordering saving time and money.
- (vi) Automated ordering and payment, lowering payment processing and paper costs.
- (vii) Improved accounting control and shorter sales to cash cycle.

**(c) (i) Business Process Re-engineering (BPR):**

BPR means not only change but radical change within a short period. This change is achieved by complete revamp of organizational structure, business process workflow, job description, performance measurement and adoption of information technology.

**Basic characteristics of BPR are as follows:**

- View business as a set of customer (both internal and external) oriented processes rather than a set of departmental functions.
- Processes must have clear cut ownership.
- Non value adding activities within a process should be eliminated.
- Gather information only once at the point of origin.

**Effect of BPR implementation:** A successful BPR implementation brings significant improvement to productivity, customer service and bottom-line. There are pain and difficulties during implementation and instances where BPR efforts did not achieve desired result. Notwithstanding, the risk is worth taking. Otherwise, there will be greater risk of being overtaken by competitors who develop and progress rapidly through BPR.

**Chapter - 5: Cyber Law and E-Commerce**

**2014 - Dec [3] (a) (iii)**

**Main reason to spread E-Commerce:**

**(a) International marketplace:**

What used to be a single physical marketplace located in a geographical area has now become a border less marketplace including national and

international markets. By becoming e-commerce enabled, businesses now have access to people all around the world. In effect all e-commerce businesses have become virtual multinational corporations.

**(b) Operational cost savings:**

The cost of creating, processing, distributing, storing and retrieving paper-based information has decreased (see Intel mini-case).

**(c) Mass customization:**

E-commerce has revolutionized the way consumers buy good and services. The pull-type processing allows for products and services to be customized to the customer's requirements.

**(d) Lower telecommunications cost:**

The Internet is much cheaper than value added networks (VANs) which were based on leasing telephone lines for the sole use of the organization and its authorised partners. It is also cheaper to send a fax or e-mail via the Internet than direct dialing.

**(e) Digitization of products and processes:**

Particularly in the case of software and music/video products, which can be downloaded or e-mailed directly to customers via the Internet in digital or electronic format.

**(f) No more 24-hours-time constraints.** Businesses can be contacted by or contact customers or suppliers at any time.

**Shuchita Prakashan (P) Ltd.**  
25/19, L.I.C. Colony, Tagore Town,  
Allahabad - 211002  
*Visit us: [www.shuchita.com](http://www.shuchita.com)*

