B.E.

Sixth Semester Examination, May-2009

Industrial Engineering (ME-312-E)

Note : Attempt any five questions.

Q. 1. (a) Describe the importance of method study and discuss the following tools used for the purpose :

(i) Operation Process Chart

(ii) Flow Process Chart

Ans. Method Study : The main purpose of method study is to eliminate the unnecessary operations and to achieve the best method of performing the operation.

According to British Standards Institutions : "Method study is the systematic recording and critical examining of existing and proposed ways of doing work as a means of developing and applying easier and more effective methods and reducing cost."

Importance of Method Study : Method study is used to simplify the way to accomplish a work to improve the method of production and so reducing the cost of production. This aim is achieved by :

(i) Better utilisation of manpower and other resources.

(ii) Elimination of unnecessary work.

(iii) Reducing unnecessary fatigue.

(iv) Identifying bottlenecks and reducing them.

(v). Improving process and procedure, layouts, methods of material handling and work conditions.

(vi) Determining the best sequence of doing work.

(vii) Minimising back tracking.

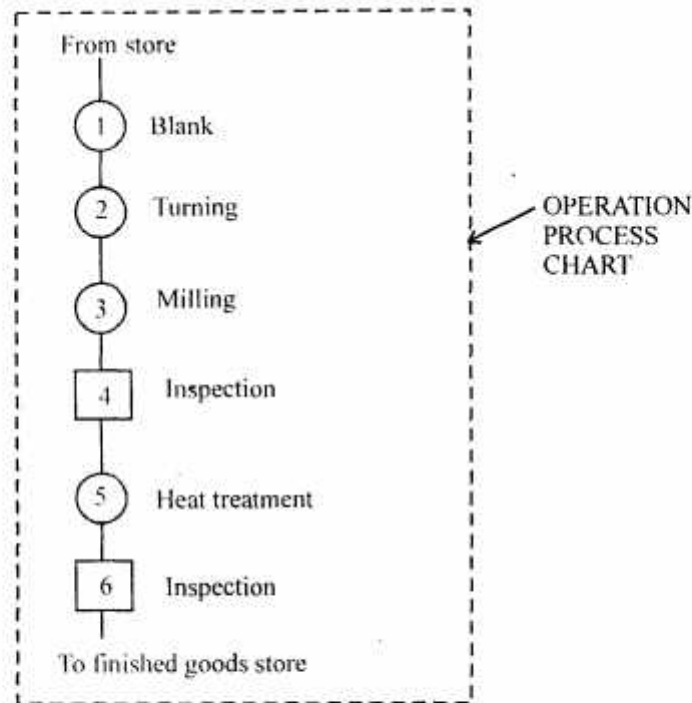(viii) Reducing the manufacturing costs through reducing cycle time of operations.

Tools Used for Method Study :

(i) Operation process chart.

(ii) Flow process chart.

Operation Process Chart : It shows the major activities and entry points of material are recorded to have a graphic view of operation and inspection involved in the particular process. As it shows only the major activities only, not the minor activities involved in the process so it is also called the outline process chart. It shows the step by step sequence of operation of a product. Activities like transport, delays and storages are not included in this chart. It does not say anything about the person who is doing the work and time when it is performed.

Let us consider a task of manufacturing a spur gear, which begins with the raw material lying in the stores and ends at the delivery of the finished product to the store through the process of blanking, turning, milling and of heat treatment with two times inspection. The operation process chart for this task which tells outline of the processes and their sequence will be.

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          From store
            |
          (1)  Blank
            |
          (2)  Turning
            |
          (3)  Milling
            |
          [4]  Inspection
            |
          (5)  Heat treatment
            |
          [6]  Inspection
            |
          To finished goods store
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OPERATION
PROCESS
CHART

Only two types of symbols are used in this type of chart i.e., ○ & ▢ which represents the operation and inspection process.

Flow Process Chart : It is the amplification of operation process chart in which operation, storage, delays and transportation are represented. It shows the flow of work of a product, on any part of it by recording it by appropriate symbols.

This charts may be of three types :

(a) Material Type : Which shows the events that occur to the materials.

(b) Man Type : Activities performed by man.

(c) Equipment Type : How equipment is used (machine type).

Five symbols for operation, inspection, transportation delay and storage are used in making this chart. The symbols are placed one below another as per the occurrence of the activities and are joined by vertical line. The flow process chart is useful to :

(i) Fix up the sequence of activities.

(ii) Reduce cycle time by combining or eliminating activities.

(iii) Reduce the distance travelled.
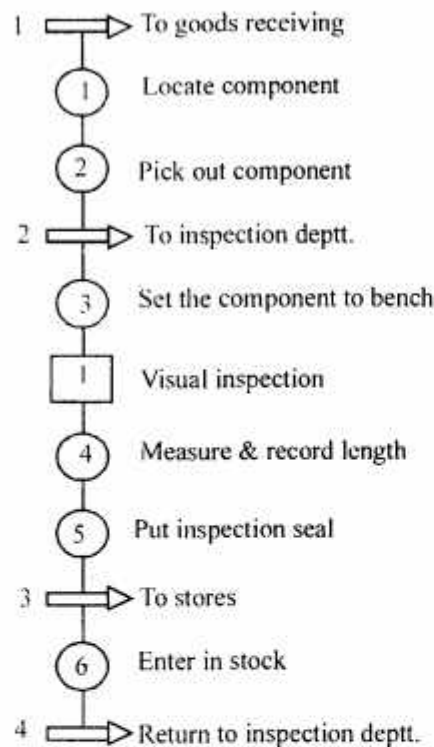
(iv) Avoid unnecessary waiting time (Dalay).

Flow Process Chart : Let us take an example of inspection of component.

Taks : Inspection of Component.
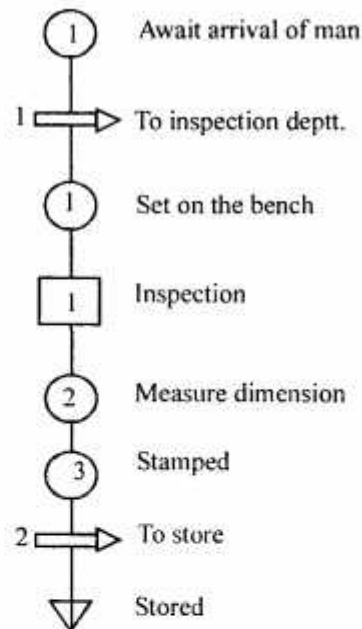
May Type

Chart begins : Man in inspection deptt.

Chart ends : Man in inspection deptt.

1 ⇨	To goods receiving
①	Locate component
②	Pick out component
2 ⇨	To inspection deptt.
③	Set the component to bench
☐ 1	Visual inspection
④	Measure & record length
⑤	Put inspection seal
3 ⇨	To stores
⑥	Enter in stock
4 ⇨	Return to inspection deptt.

Material Type

Material in goods receiving

Material in stores.

①	Await arrival of man
1 ⇨	To inspection deptt.
①	Set on the bench
☐ 1	Inspection
②	Measure dimension
③	Stamped
2 ⇨	To store
▽	Stored

Summary

Symbol	○	⇨	☐		○	⇨	☐	◗	▽
Frequency	6	4	1		3	2	1	1	1

Q. 1. (b) What do you understand by the term normal time of an operation? How can it be determined? What differentiates normal time from standard time for operation?

Ans. Normal Time of an Operation : Time study is the most widely used technique of work measurement. It is the technique of measurement to establish time for a qualified worker to carry out a specified condition and at the defined level of performance.

To calculate the time of a definite task we have to observe time with the help of stop watch when some one (worker) is performing that task. So, this time will be the observed time for that task for a particular worker. But we want to calculate the normal time of that task which should be general time. As the efficiency of doing job/ task may be different for different worker. So, this observed time may not be the normal time. We can say the normal time to that time which will be required to perform a task by a person of normal efficiency i.e., 100"% rating.

So, if we know the performance rating of the person which under the study or watch we can calculate the
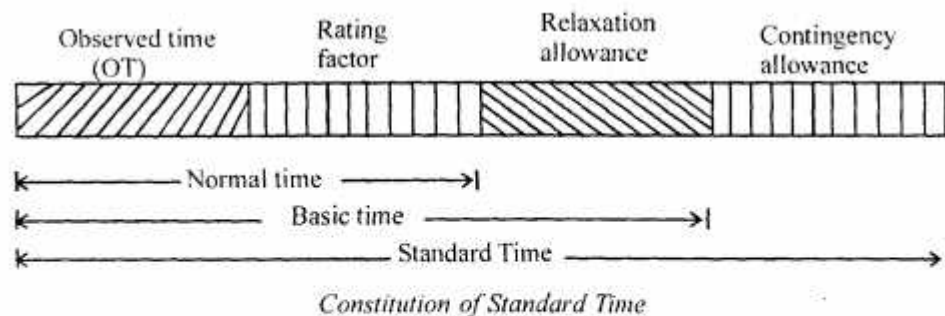
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normal time of that task by multiplying the observed time by the performance rating.

$$\text{Normal time} = \frac{\text{Observed Time} \times \text{Rating}}{100}$$

So, normal time is time which would had been taken had the work done at the standard rate of working i.e., 100%. without any relaxation allowance being taken.

Difference Between Standard Time & Normal Time : Normal time is the time in which a normal worker with rating factor 100 will do the job. But in actual practice. A worker doing some job will tired after some time of doing work so he has to take rest which will loss some time so this time may also be included in normal time called fatigue allowance or relaxation allowance. A long with this fatigue allowance some contingency allowance also need for some unpredictable work done by worker (like drinking water, disturbance by others etc.)
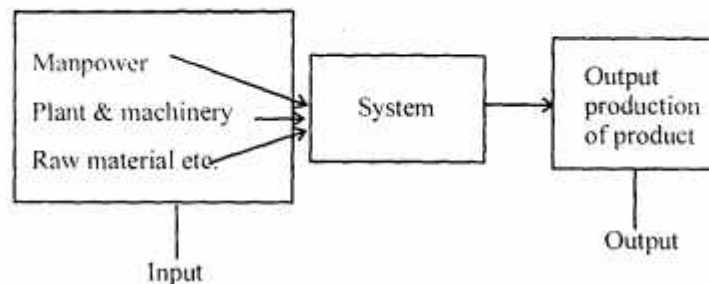
So, in actual practice along with the given task this contingency work will occur simultaneously but there prediction and time calculation is not possible so some approximate time allowance is added to the basic time (Normal time + fatigue allowance). Which will be the actual time to complete the task this time is called the standard time.

Constitution of Standard Time

Q. 2. (a) How is the productivity measured? What are the factors affecting productivity? How can this be improved?

Ans. Productivity : Productivity is the measure of how well the resources are brought together in an organisation and utilised for accomplishing a set of objectives.

For example in a manufacturing units the resources are man power, machines, capital, raw material etc. and the objective will be to produce more & more units of product with a standard quality. So, how well the resources i.e., manpower plant & machinery, raw material, capital etc. are used may be measured by measuring the output of the organisation for particular sets of resources or by measuring that how less resources are used to produce a particular output i.e., we can say that numerically the productivity of a system i.e., the rate of output to input.

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As there may be so many inputs in that case either we calculate the productivity in relation to one of the input considering all other inputs as zero which is called partial measurement of productivity. OR we can use the sum of all inputs as denominator in productivity measurement.

$$\text{Total productivity} = \frac{\text{Output}}{\text{Total Input}}$$

$$\text{Productivity of man power} = \frac{\text{Output}}{\text{Input Manpower}} \text{ etc.}$$

Factors Affecting Productivity : There are so many factors which may affect the productivity which are classified into two categories :

(i) Controllable (Internal factors)

(ii) Non-controllable (External factors)

(i) Controllable Factors are those factors which can be controlled by the organisation as these factors are because of organisation itself.

This may be because of :

(i) Product   (ii) Plant & Equipment

(iii) Technology   (iv) Materials

(v) Human factor   (vi) Work method

(vii) Management   (viii) Financial factor.

(ii) Non-Controllable Factors are those factors which cannot be controlled by the organisation as these factors are because of external sources like :

(i) Natural resources   (ii) Weather condition

(iii) Government policy   (iv) Infrastructure.

As an organisation cannot change the government policy or the weather conditions etc. to these factors may not be avoided. Hence, these are called non-controllable factors.

Ways to Improve Productivity : The ways which can increase the productivity are :

(i)   Mannual labour be replaced by machines.

(ii)   Use of automation and reliable machines.

(iii)   Work force should be motivated.

(iv)   Better planning and coordination.

(v)   Use of management information system.

(vi)   Better scheduling and material flow.

(vii)   Avoiding bottlenecks in line balancing.

(viii)   Better work method.

(ix)   On job training of workers.

(x)   Better lighting and better ventilation.

(xi)   Use of quality improvement program like, quality circle, total quality management Kaizen, J.I.T. 55.

(xii)   Use of Good Pay Structure & Incentive Schemes.

(xiii)   Use of newer technology.

(xiv) Making safe work place.

(xv) Better political stability.
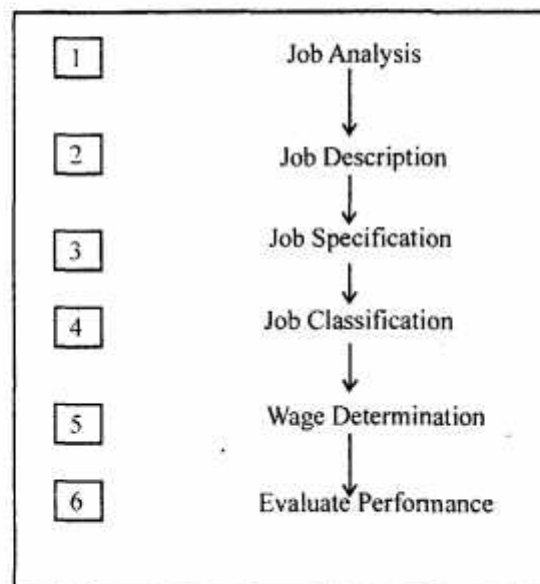
(xvi) Globalization and open market economy.

Q. 2. (b) What is Job Evaluation? What are the objectives of job evaluation ? Explain in detail job evaluation procedure.

Ans. Job Evaluation : Job evaluation is a process to determine in a systematic manner and analytically the worth of each job in the organisation based upon the set of carefully selected factors such as skill, effort and responsibility demanded by the job and translating these worth of jobs into monetary terms (i.e., pay and wages).

Objectives of Job Evaluation : The main objectives of job evaluation are as follows :

(i) To establish a sound wage and salary system by determining the worth of each job in relation to various factors like skill required, effort and responsibility involved.

(ii) To establish the general wage level, which would be comparable with factories nearby i.e., The eliminate wage inequalities.

(iii) To formulate an appropriate and uniform wage structure.

(iv) It provides basis for ranking different jobs.

(v) To clearly define the line of authority and responsibility.

(vi) To provide a sound base for recruitment, selection, promotion and transfer of employees.

(vii) To identify training needs of the employees so as to prepare them for future positions.

(viii) A sound base for individual performance measurement.

(ix) To promote a good employee-employer relations.

Procedure for Job Evaluation : The steps involved in job evaluation are as follows :

1	Job Analysis
2	Job Description
3	Job Specification
4	Job Classification
5	Wage Determination
6	Evaluate Performance

(a) Job Analysis : Job analysis is the process of determining the facts relating to the jobs. It involves a systematic examination of the job to find out.

(i) Nature of task performed by workers.

(ii) Purpose or objective of the task.

(iii) Working conditions under which the tasks are carried out.

(iv) Responsibility, skill required to perform task.

(v) Relationship between various jobs done in the department/organisation.

(b) Job Description : Job description follows the job analysis. It describe clearly the requirements of job like duties, responsibilities, working conditions and other required facts.

(c) Job Specification : Job specifications are prepared from the data collection during the job-analysis. It is the statement of qualities and capabilities that an employee must possess to perform the job satisfactorily (like education, experience, physical effort, responsibility of other work, material, machine and equipment etc. present in the job and difficulty present in).

Job description and the job specification both forms the bases for job evaluation and therefore it is essential to make it sure that the facts are presented correctly.

(d) Job Classification : After job description and job specification which are base of job evaluation. Job classification is done in which we determine the relative worth of jobs. So, this is very important step of job evaluation for which there are four accepted systems of evaluation called job evaluation system :

(i) Ranking Method : In which a committee is formed which ranks the different job according to their importance.

(ii) Job Classification System : In which the jobs are allocated to grades which are predefined. The grade differences are defined in terms of differences in the level of duties responsibilities and requirements of special skills.

(iii) Factor Comparison Method : This is a quantitative approach, in which five key factor scales are used for analysis and evaluating jobs. These factors are :

(i) Skill,

(ii) Mental effort,

(iii) Physical effort

(iv) Responsibility

(v) Working condition.

(iv) Point Method : It is a detailed quantitative technique, in which each job is broken into different component factors. For each factor a point or weight is assigned as per its relative importance. And sum of all these point in job weightage.

(e) Wage Determination : Compare the job classification value with predetermined job and arrive at suitable wage structure.
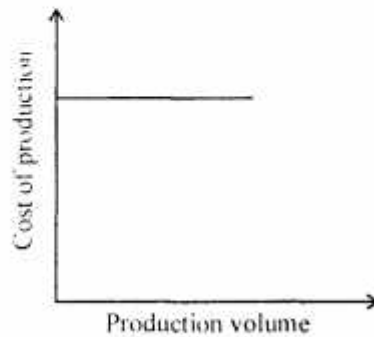
(f) Evaluate Performance : And finally evaluate performance on the bases of job description and specification.

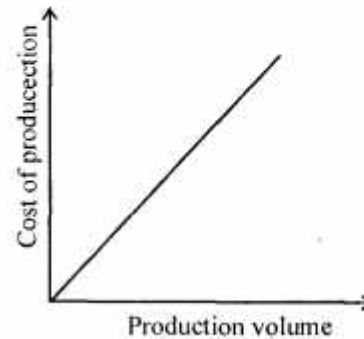### Q. 3. (a) Distinguish between fixed and variable costs.

Ans. Fixed Cost vs Variable Cost : Fixed costs are those elemental costs which remain unaffected by the change in volume or level of activity. In a factory, suppose 100 items are manufactured in a month, for this production volume, the rent of building is Rs. 50,000 P.M. Now suppose in next month, the production falls to 90 items. The rent of the building will remain the same. So this is a fixed cost which is beared by the owner of the manufacturing unit. Other examples of the fixed cost may be administrative staff salary depreciation of machinery, building, office cars etc.

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Whereas the variable costs are those elements of costs which are proportional to the production volume. These cost are in the form of direct material, direct labour (worker/operator). Suppose for current month we have to produce 100 units for which x unit of raw material is required and if we required to produce 90 units in next month then for next month, we have to purchase only $\frac{90}{100} x = \frac{9x}{10}$ units of raw material. So the raw material cost depends on the no. units of the product to be produced therefore the cost of raw material will be the variable cost. Other example of variable cost may be consumable items used in production.

If we plot the graph of these cost w.r.t. production volume. The graphs will be,

(a) Fixed costs   (b) Variable costs

Q. 3. (b) The list price of a machine is Rs. 6000 and the distributor is allowed 20% discount. The marketing and administrative expenditure is 50% of factory cost and the material cost, labour cost and factory overheads are in the ratio 1:3 :2. If the cost of labour on the manufacture of the machine is Rs. 1200 determine the profit on each machine.

Ans. List price of machine   Rs. 6000/-

Discount   = 20%

Marketing & admin. expenditure = 50% of factory cost

Material cost : labour cost : factory overheads = 1 : 3 : 2

Cost of labour   = Rs. 1200/-

Profit on each machine   = ?

$$\frac{\text{Material cost}}{\text{Labour cost}} = \frac{1}{3}$$

Material cost $= \frac{1}{3}$ labour cost $= \frac{1}{3} \times 1200 = 400/-$

Material cost per machine   = Rs. 400/-

$$\frac{\text{Labour cost}}{\text{Factory overheads}} = \frac{3}{2}$$

Factory overheads $= \frac{2}{3}$ labour cost $= \frac{2}{3} \times 1200$

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Factory overheads per m/c = Rs. 800/-

$$\text{Factor cost} = \text{Material cost} + \text{Labour cost} + \text{Overheads}$$

$$= Rs(400 + 1200 + 800)$$

$$= Rs. 2400/-$$

Marketing & admin. expenditure = 50% (Factory cost)

$$= \frac{50}{100} \times 2400 = 1200/-$$

Marketing & admin. expenditure = Rs. 1200/-

$$\text{Total cost} = \text{Factory cost} + \text{Marketing cost}$$

$$= 2400 + 1200 = Rs. 3600/-$$

List price = Rs. 6000/-

Discount $$= \frac{20}{100} \times 6000 = Rs. 1200/-$$

After 20% discount sales price

$$= \text{List price} - \text{Discount}$$

Sales price $$= 6000 - 1200 = Rs. 4800/-$$

Profit per m/c = Sales price − Total cost = 4800−3600

Profit = Rs. 1200/- **Ans.**

Q. 4. In an organization, the requirement of an item is 10000 units per annum at uniform rate. The procurement cost is Rs. 10 per order. The item costs Re. 1 per unit. Carrying cost is 20% of unit cost per annum. Back out or shortage cost is Rs. 5 per unit of shortage incurred. Determine the following :

(i)   Economic Order Quantity

(ii)   Maximum inventory level

(iii) Shortage Quantity

(iv)   Cost of shortage

(v)   Total cost of inventory.

Ans. (D) Annual demand for items

$$= 10000$$

(C_o) Procurement cost = Rs. 10/- per order

(C_p) Cost per unit = Rs. 1/- per unit

(1) Carrying cost (1) = 20% of unit cost per annum.

Shortage cost = Rs. 5/- per unit of shortage.

(i) Economic Order Quantity :

$$E.O.Q. = \sqrt{\frac{2DC_o}{C_h}\left(\frac{C_s + C_h}{C_s}\right)}$$

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Where, D = Annual demand

C_o = Procurement/ordering cost

C_h = Inventory carrying cost (Rs./unit/unit time)

C_s = Shortage cost (per unit/per period)

$$E.O.Q. = \sqrt{\frac{2 \times 10000 \times 1000}{0.2}\left(\frac{5+0.2}{5}\right)} = \sqrt{10^6(1.04)}$$

$$E.O.Q. = 1.0198 \times 10^3 = 1020\,units.$$

(ii) Maximum Inventory Level (S):

$$S = \sqrt{\frac{2DC_o}{C_h}\left(\frac{C_s}{C_s + C_h}\right)}$$

$$= \sqrt{\frac{2 \times 10000 \times 10}{0.2}\left(\frac{5}{5+0.2}\right)}$$

$$= \sqrt{\frac{10^6}{1.04}} = 980.580$$

$$S = 981\,units.$$

(iii) Shortage Quantity :

Shortage Quantity $= Q - S$

$= 1020 - 981$

$= 39\,units.$

(iv) Cost of Shortage :

Cost of shortage = 39 units × Rs. 5/unit

$= Rs.\ 195/\text{-}$

(v) Total Cost of Inventory :

$$T = \sqrt{2DC_oC_h\left(\frac{C_s}{C_h + C_s}\right)} = \sqrt{2 \times 10000 \times 10 \times 0.2\left(\frac{5}{5+0.2}\right)}$$

$$T = \sqrt{\frac{40000}{1.04}} = Rs.196.116/\text{-}\qquad \textbf{Ans.}$$

Q. 5. (a) Explain concept of OC curve for an acceptance sampling plan.

Ans. OC Curve : O.C. curve stands for operating characteristic curve. It is the graph of fraction defective in a lot against the probability of acceptance.

For any fraction defective 'p' in a submitted lot, the OC curve shows the probability p_a that such a lot will

be accepted by the sampling plan. In a single sampling plan three parameters are specified.

N = Lot size

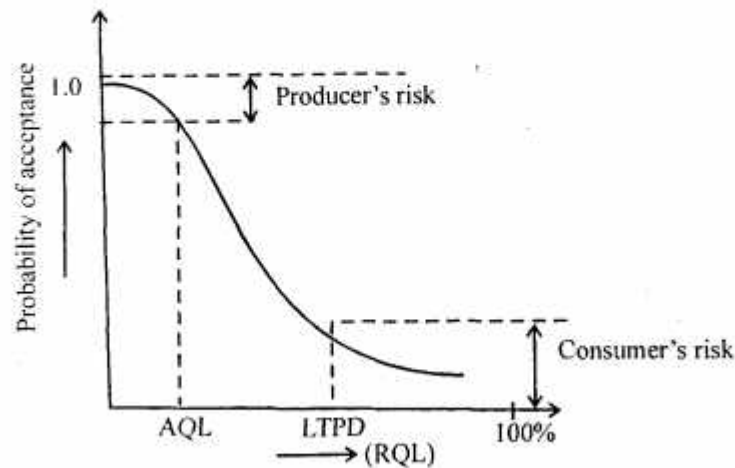n = Sample size

c = acceptance number

Fig. (a) : Percentage Defective (P)

Before discussing about OC curve, it would be better to clear some important word. These are :

A.Q.L : Acceptance quality level, which is the limit upto which the defective in a lot can be accepted.

L.T.P.D/R.Q.L : Lot Tolerance Percentage Defective/Rejectable Quality Level, which is the limit of defective in a lot above which the lot will be rejected. There are always two parties to an acceptance procedure the party submitting the product for acceptance and the party for whom the decision is made regarding acceptance or rejection.
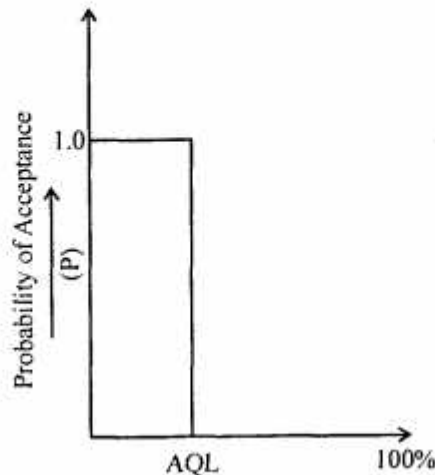

Fig. (b) Percentage Defective

In ideal condition the sampling should be as, if the defective in the lot is below A.Q.L. the lot should be accepted and if the lot is above R.Q.L. (L.T.P.D.) the lot should be rejected. But it is not compulsory that the defective in the lot are exactly represented in the sample so there are chances of accept the lot when the defective in the lot are above R.Q.L. (called consumer's risk) and also there are chances of reject the lot when the defective in the lot are below A.Q.L. called producer's risk. As shown in fig. (a).

In single sampling plan the A.Q.L. & R.Q.L. are the same. So the O.C. curve for ideal condition should be like the rectangle as shown in fig. (b).

When the percentage defective in below AQL, the probability of acceptance is 1.0 and when the percentage defective is above A.Q.L.

The probability of accepting the lot is zero. Hence, we can say that there is no producer's risk and no consumer's risk.

Q. 5. (b) State the advantages of quality control. Show clearly how it can reduce the cost of production.

Ans. Quality Control : Quality control is the process through which we measure the actual quality performance or characteristic, compare it with standard and take corrective action if there is a deviation.

Advantages of Quality Control : Following are the main advantages of effective quality control :

(i)   Reduces company's cost through reduction of losses due to defects.

(ii)   If Q.C. is effective, the scrap, rework and sorting are reduced a lot.

(iii) Reduces customer returns (lot rejected by customer).

(iv)   To achieve interchangeability in large scale production.

(v)   Increase the probability of acceptance of lot by the customer.

(vi)   Increase customer's satisfaction and faith.

(vii) Develop quality consciousness in organisation as well as in vendor's also and thus ensures defect free raw material.

(viii) Improve the reputation of producer in the market.

(ix)   Improve reliability and maintanability.

Good Quality Control Reduces the Cost of Production : Whenever any company produces any product. The following costs are involved in producing the product. Starting from the product development cycle i.e., Marker research to the end i.e., final production of producer :

(i)   Market research cost (to know the needs of customer).

(ii)   Product research cost (to create a product concept).

(iii) The design cost (translating product concept to design).

(iv)   Cost of manufacturing planning.

(v)   Cost of material.

(vi)   Direct labour cost.

(vii) Depreciation of plant and machinery.

(viii) Factory overheads.

(ix)   Cost of inspection and test.

(x)   Cost of defect prevention.

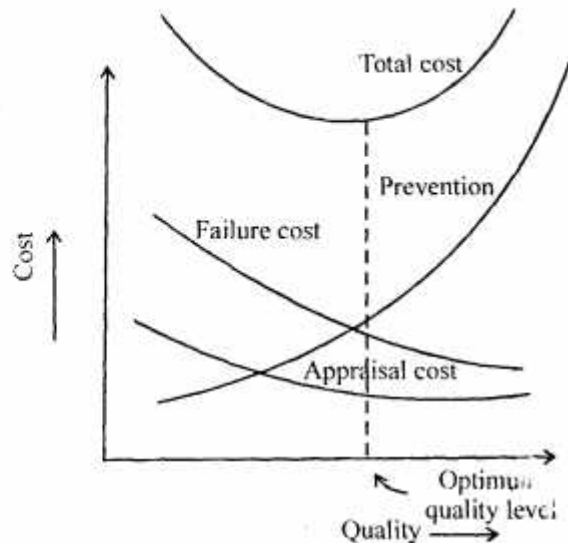(xi)   Cost of scrap, quality failure.

(xii) Cost of quality assurance.

(xiii) Cost in collecting field service data for improvement etc.

In all these cost the three types of costs i.e.,

(i) Cost of prevention

(ii) Cost of appraisal

(iii) Cost of failure

are affected by the quality control process of the company or factory as per the relation as shown in fig.

If we want to achieve a very high quality level then the prevention taken to achieve this increases the prevention cost, but as the quality level of the product increases the chance of failure decreases and hence decreases the failure cost. And also the need of inspection decreases so the appraisal cost also decreases. So the combined cost of all three decreases upto a limit of quality level known as optimum quality level at which we should produce the

product to reduce this total cost which directly affect the manufacturing cost or cost of production which is because of Q.C. So we can say that quality control reduces the cost of production till the optimum quality level is achieved.

Q. 6. (a) Enumerate the principal functions of PPC and discuss each of them briefly.

Ans. Production consists of a series of sequential operations to produce a desirable product acceptable to customer and meets the customer demand.

Production planning and control is a tool available to the management to achieve the objectives. Production planning starts with the analysis of the given data such as demand for products, delivery schedule etc. and on the basis of information available, a scheme of utilization of firms resources are worked out to obtain the target. PPC helps to achieve uninterrupted flow of materials through production line by making available the materials at right time and required quantity.

The principle functions of PPC are :

(a) Material function, (b) Machine and equipment (c) Method of manufacturing (d) Process planning or routing (e) Estimating (f) Loading & scheduling (g) Dispatching (h) Expediting (i) Inspection (j) Evaluation.

(a) Material Function : For an uninterrupted production and to ensure the correct start and end of each operation, the required quantities of raw materials, finished parts, bought out components should be made available. Specification of materials, delivery data, variety reduction, procurement and make or buy decisions are the function of PPC.

(b) Machines and Equipments : In this, the available production facilities, equipment downtime, maintenance policy procedure and schedules are analysed. Economy of jigs & fixtures are also analysed.

(c) Method : The analysis of alternatives and selection of the best method of manufacturing will be carried out. Developing specifications for processor is an important aspect of PPC and determination of sequence of operations.

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(d) Process Planning or Routing : In the production process, the raw material has to follow the route or path to get transformed into finished product. The routine will be done in this function. Fixation of path, breaking down of operations to define each operation in detail, deciding the setup time and process time for each operation are done.

(e) Estimating : The operations times are estimated by fixing the sequence of operations, process sheet for each operation will be made available. The analysis of operations along with methods and routing and a standard time for operation are estimated using work measurement techniques.

(f) Loading and Scheduling : By estimating the starting and completion data for each of the operations, machine loads are scheduled. Machine have to be loaded according to their capability of performing the given task and according to their capacity.

(g) Disapatching : Process of setting production activities in motion through releases of orders and instructions. It authorise the start of production activities by releasing materials, components, tools, fixture and instruction sheets to the operator. The function includes to assign definite work to definite machines, work center and men, to issue required materials from stores, to issue jigs and fixtures and make them available at correct point of use. Release necessary work orders, time tickets to record start and finish time of each job.

(h) Expediting : The follows up or "progress" work is done in this function. A close observation on the progress of the work is made so that to eliminating bottlenecks, delays and interruptions of production.

(i) Inspection : It is a very important function in PPC both for the execution of the current plans and its scope for future planning

(j) Evaluation : A thorough analysis of all the factors influencing the production planning and control helps to identity the weak spots and the corrective action with respect to preplanning and planning will be effected by a feedback. The success of this step depends on the communication, data and information gathering and analysis.

Q. 6. (b) There are seven jobs which are to be processed first on machine 1 and then on machine 2. Processing times in hours are given below :

Job	A	B	C	D	E	F	G
Machine 1	6	24	30	12	20	22	18
Machine 2	16	20	20	13	24	2	6

Find the optimal sequence and total elapsed time. Compute the idle time on machine 2.

Ans. Seven Jobs & 2 Machine :

Job	A	B	C	D	E	F	G
Machine 1	6	24	30	12	20	22	18
Machine 2	16	20	20	13	24	2	6

By considering smallest machining time of machine 1 on left side of box & smallest machining time of machine 2 on right side of box the job sequence is obtained.

Job Sequence :

A	D	E	B	C	G	F

This sequence is optimum one. The total elapsed time is calculated as :

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	Machine 1		Machine 2		Idle Time
	In	Out	In	Out	on M/c 2
A	0	6	6	22	6
D	6	18	22	35	0
E	18	38	38	62	3
B	38	62	62	82	0
C	62	92	92	112	−10
G	92	110	112	118	0
F	110	132	132	134	−14

The total elapsed time is 134 hrs.

Idle time at machine 2 is 33 hrs.

Q. 7. "Value engineering prevents unnecessary cost build up into the product". Explain.

Ans. Value engineering have a vital and critical role to prevent unnecessary use of resources and unnecessary costs. The core of Value Engineering is substitution by equivalents at lower costs. Most products or services that are offered cost us much more than they should do. For a definite and predetermined requirement, the product or service should be most appropriate. It should meet all requirements fully, no more and no less; and at the least cost possible. In accomplishing these requirements, Value Engineering has no parallel. Value

varies inversely with cost, function remaining the same value. $= \dfrac{\text{Necessary Function} + \text{Unnecessary function}}{\text{Cost}}$

Unnecessary costs are those "that provide neither quality, nor use, nor life, nor appearance, nor customer features." It is difficult to identity, isolate and or reduce it, if not totally eliminate it. It is more likely to be hidden. Unnecessary costs can be due to at least nine indentifiable reasons. Lack of information, Lack of creative ideas, Lack of time, Honest wrong beliefs, Habits, Attitudes and prejudices, Temporary circumstances, Poor communications. One solution fixation, Non-value adding work Value Engineering establishes an analytical framework for determining the function of a project, product, process, service or operation.

Once the functions are agreed upon, Value Engineering uses a methodology for reducing cost at the same time that the performance, quality and acceptance of the product or service are enhanced or the efficiency of the process or operations, improved. The job plan has matured into a powerful tool, capable of solving all product and cost improvement problems.

The problem is broken into specifies, avoiding generalities. All relevant, accurate and meaningful data are collected for helping the decision making. Facts are ascertained. Costs are determined. Money value is put on each finish, tolerance allowance and specification. It will be natural to meet with road blocks, which have to be identified and overcome. Next the function phase is the key to the value effort. The basic and support functions are defined. The klystron of Value Engineering lies in starting the function in a two word, verb noun combination. Work functions are always expressed in active verbs and measurable nouns, which establish quantitative statements. Sell functions in passive verbs and non-measurable nouns. Costs are determined. In the creative phase, creative ideation techniques are used to generate a multitude of ideas, products, processes, method etc. to accomplish the definite functions. It involves two mental processes : the creative and the judicial. Suppressing the judicial, a quantity of ideas providing for the define functions are generated. In evaluation phase, the judicial mind is brought into active use. The quantity of ideas generated in the creation phase are now appraised, modified, refined and combined to generate the change proposal.

Function alternative are developed, compared and estimated for costs. The best ideas are selected. The creative ideas so refined, evaluated and compared are then subject to investigation in the investigation phase. Vendor consultations, assistance of company and industrial specialists, use of company standards, industrial and national standards that are applicable, lead to the most reasonable, practical, low cost, high value solutions without impairing the use and esteem factors, quality, safety reliability, durability etc. Several question are applied before the value alternative of merit is finally decided upon. The value change alternative of merit is ready for recommendation, approval and due implementation.

By this way the Value Engineering prevents unnecessary cost build up into the product.
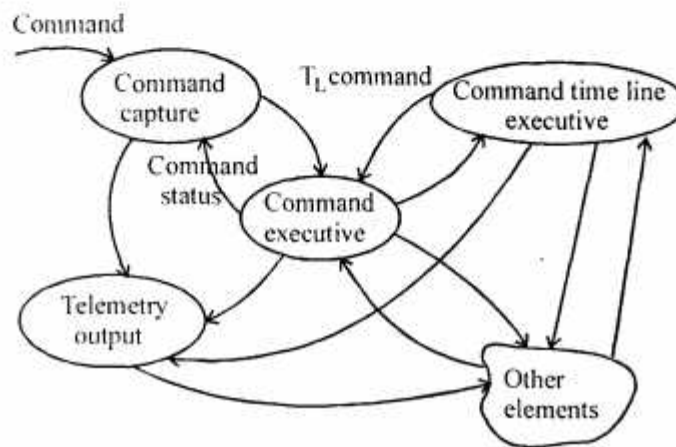
Q. 8. Write short notes on the following :

(i)   Role of MIS in decision making

(ii)   Data flow diagram

(iii) Organizing information systems.

Ans. (i) Role of MIS in Decision Making : Management Information System (MIS) is a subset of the overall internal controls of a business covering the application of people, documents, techniques and procedures by management accountants to solve business problems such as costing a product, service or a business-wide strategy. MIS are used to analyse other information system applied in operational activities in the organization. In business and other organizations, internal reporting was made manually and only periodically, as a by product of the accounting system and with some additional statistics and gave limited and delayed information on management performance. Data had to be separated individually by the people as per the requirement and necessity of the organization. Later data and information was distinguished and instead of the collection of mass of data, important and to the point data that is needed by the organisation and was stored. As applications were developed that provided managers with information about sales, inventories and other data that would help in managing the enterprise. A marketing information system consisting of people, equipment and procedure to gather, sort, analyze, evaluate and distribute needed, timely and accurate information to marketing decision makers.

(ii) Data Flow Diagram :

An Example :

It is a graphical representation of the 'flow' of data through an information system. It can also be used for the visualization of data processing. On a DFD, data items flow from an external data source or an internal data store to an internal data store or an external data sink, through an internal process. DFD provides no information about the timing or ordering of processes or about whether processes will operate in sequence or in parallel. It shows the flow of control through an algorithm, allowing a reader to determine what operations will be performed, in what order and under what circumstance but not what kinks of data will be input to and output from the system. nor where the data will come from & go to, nor where the data will be stored.

DFD are one of the three essential perspectives of the structured-system analysis and design method. The sponsor of a project and the end users will need to be briefed and consulted throughout all stages of a system evolution. With a data flow diagram, users are able to visualize how the system will operate, what the system will accomplish and how the system will be implemented. The old system's data flow diagrams can be drawn up and compared with the new system's data-flow diagram to draw comparisons to implement a more efficient system. DFD can be used to provide the end user with a physical idea of where the data they input ultimately has an effect upon the structure of the whole system from order to dispatche to report. The analyst or designers is forced to address how the system may be decomposed into component sub-systems and to identify the transaction data in the data model.

(iii) Organizing Information System : The effectiveness of PPC depends to a greater extent upon the accuracy of the information it gets from other departments. The information system should be organize properly so that the obtained information should be correct and timely approachable.

Department

Marketing	Engineering purchase and stores	
		PPC department

Production programme
(i) Quality produced
(ii) Delivery date
(iii) Variety & different

models and special features

Quality standards
specification
& tolerance

Production material
(i) Types of materials
(ii) Quality & quantity
(iii) Procurement lead time
(iv) Stock position
(v) Tooling
(vi) Standard times for
    operation & set up time

Production

(a) Starting & finishing dates
(b) Progress of work

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