

Solution cum Scheme of Evaluation

IV/IV B.Tech (Regular) Degree Examination

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Industrial Engineering & Entrepreneurship Development

Mechanical Engineering

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a) Management is an art of getting things done through the efforts of other people. 1x12 = 12M

b) Minimization of unproductive work

Reduces uncertainty

Maximum utilization of resources

c) An organization consists of people who carry out differentiated tasks which are coordinated to contribute to the organizations goals.

d) Method study

“Method study is the systematic recording and critical examination of existing and proposed ways of doing work as a means of developing and applying easier and more effective methods and reducing costs”

e) Measures to Improve Productivity

Productivity of any system can be improved either by proper use of resources or by effective utilization of system or processes. Some action plans are:

1. Machine : manual labor be replaced by machines
Reliable machines
Automation
2. Management: Motivated workforce
Better planning and coordination
Effective control of processes
3. Process: computerization of system
Use of management information system
Improvement in scheduling
Better material flow
Fast and accurate retrieval of parts

f) Performance rating is the step in the work measurement in which the analyst observes the worker's performance and records a value representing that performance relative to the analyst's concept of standard performance

g) When a decision on acceptance or rejection of the lot is made based on single sample drawn then it is called single sampling plan.

h) Job evaluation

Job evaluation evaluates the job. Job evaluation determines suitable wage structure for the job.

Job evaluation does not recognize individual performance or variation within the job. It merely determines wage and salaries level for jobs.

- i) 1. To help the organization to attain its goals effectively and efficiently by providing competent and motivated employees.
2. To utilize the available human resources effectively.
3. To increase to the fullest the employee's job satisfaction and self-actualization.
4. To develop and maintain the quality of work life (QWL) which makes employment in the organization a desirable personal and social situation.
5. To help maintain ethical policies and behavior inside and outside the organization.
6. To establish and maintain cordial relations between employees and management.
7. To reconcile individual/group goals with organizational goals.

j) Entrepreneurial development:

Entrepreneurial development is must for the economic development. For the purpose of entrepreneurial development rapid growth of small scale sector is required. Further more entrepreneurial development programmes are designed to help an individual in strengthening his entrepreneurial motive and in acquiring skills and capabilities essential for playing his role effectively.

The main goal of the entrepreneurial development programme is to motivate and assist potential and prospective entrepreneurs to establish small scale units of their own to acquire self employment and contribute significantly towards production and employment situation.

k) Factors affecting Entrepreneurship

1. Great need for achievement
2. Urge for independence
3. Urge for power
4. Family Background
5. Flexibility
6. Creative and Innovative spirit
7. Fluency
8. Decision making capacity

l) In a marketing, *a* product is anything that can be offered to a market that might satisfy a want or need.

UNIT I

2. a)

6M

LEVELS OF MANAGEMENT

The term level means arrangement of persons in a series. Thus the term level of management refers to the arrangement of managerial positions in an organization. There is no fixed number of management levels for a particular organization. It all depends on the size, technology and the range of production of the organization. Moreover, the number of management levels cannot be increased to an unlimited extent as:

- i) it makes coordination and control difficult ii)it increases the gap between the top management and the rank and file, and iii)it complicates the communication problem.

Management levels determine the authority relationship in an organization. There are three levels of management in view of authority and responsibility relationship. They are

1. Top level management.
2. Middle level management
3. Lower level management

TOP LEVEL MANAGEMENT

Top management is the head of an organization. It consists of the board of directors and the chief executive or the managing director. In the operation of an organization, top management is the final source of authority. It establishes policies, plans and objectives. Thus, the various functions of top management may be enumerated as follows.

1. Determining objectives of the enterprise
2. Preparing policies and plans for the enterprise
3. Issuing instructions for the preparation of departmental budgets, schedules, procedures and so on
4. Appointing executives for the middle level
5. Providing overall leadership
6. Building and maintaining relations with the outside public

MIDDLE LEVEL MANAGEMENT

Middle level management generally consists of heads of functional departments. It is concerned with the task of implementing the policies and plans laid down by the top management. It is also a link between the top management and the lower level management. Thus, the various functions of middle management may be defined as follows:

1. Executing plans in accordance with the policies and directives of the top management
2. Selecting suitable operative and supervisory personnel
3. Assigning duties and responsibilities for timely execution of plans
4. Evaluating the performance of the junior managers
5. Achieving coordination between different departments
6. Motivating personnel to achieve higher productivity
7. Collecting information on performance
8. Making recommendations to top management

LOWER LEVEL MANAGEMENT

Supervisory management is the lowest level in the hierarchy of management. It consists of supervisors, foremen, account officers, sales officers, and so on. They are directly concerned with the control of the performance of the operative employees. They assign specific jobs to the workers, evaluate their performance and report to the middle level management. Thus, the various functions of a supervisor may be defined as follows:

1. To plan the activities of his section
2. To issue orders and instructions to the workers
3. To provide training to the workers
4. To solve the problems of workers
5. To maintain good human relations
6. To maintain discipline among the workers
7. To act as liaison between the middle level management and the rank and file workers
8. To send periodical performance reports to the middle management

2. b) Henry Fayol Principles of Management

6M

Management principles are statements of fundamental truth. These principles serve as guidelines for decisions and actions of managers. They are derived through observation and analysis of events which managers have to face in practice.

1. Division of Work

The specialization of the workforce, creating specific personal and professional development within the labour force and therefore increasing productivity; leads to specialization which increases the efficiency of labour. By separating a small part of work, the workers speed and accuracy in its performance increases. This principle is applicable to both technical as well as managerial work.

2. Authority and Responsibility

The issue of commands followed by responsibility for their consequences. Authority means the right of a superior to give order to his subordinates; responsibility means obligation for performance. This principle suggests that there must be parity between authority and responsibility.. They are co-existent and go together, and are two sides of the same coin.

3. Discipline

Discipline refers to obedience, proper conduct in relation to others, respect of authority, etc. It is essential for the smooth functioning of all organizations.

4. Unity of Command

This principle states that every subordinate should receive orders and be accountable to one and only one superior. If an employee receives orders from more than one superior, it is likely to create confusion and conflict.

Unity of Command also makes it easier to fix responsibility for mistakes.

5. Unity of Direction

All those working in the same line of activity must understand and pursue the same objectives. All related activities should be put under one group, there should be one plan of action for them, and they should be under the control of one manager.

It seeks to ensure unity of action, focusing of efforts and coordination of strength.

6. Subordination of Individual Interest

The management must put aside personal considerations and put company objectives first. Therefore the interests of goals of the organization must prevail over the personal interests of individuals.

7. Remuneration

Workers must be paid sufficiently as this is a chief motivation of employees and therefore greatly influences productivity. The quantum and methods of remuneration payable should be fair, reasonable and rewarding of effort.

8. The Degree of Centralization

The amount of power wielded with the central management depends on company size. Centralization implies the concentration of decision making authority at the top management. Sharing of authority with lower levels is called decentralization. The organization should strive to achieve a proper balance.

9. Scalar Chain

Scalar Chain refers to the chain of superiors ranging from top management to the lowest rank. The principle suggests that there should be a clear line of authority from top to bottom linking all managers at all levels. It is considered a chain of command. It involves a concept called a "gang plank" using which a subordinate may contact a superior or his superior in case of an emergency, defying the hierarchy of control. However the immediate superiors must be informed about the matter

10. Order

Social order ensures the fluid operation of a company through authoritative procedure. Material order ensures safety and efficiency in the workplace.

11. Equity

Employees must be treated kindly, and justice must be enacted to ensure a just workplace. Managers should be fair and impartial when dealing with employees.

12. Stability of Tenure of Personnel

The period of service should not be too short and employees should not be moved from positions frequently. An employee cannot render useful service if he is removed before he becomes accustomed to the work assigned to him.

13. Initiative

Using the initiative of employees can add strength and new ideas to an organization. Initiative on the part of employees is a source of strength for the organization because it provides new and better ideas. Employees are likely to take greater interest in the functioning of the organization.

14. Esprit de Corps

This refers to the need of managers to ensure and develop morale in the workplace; individually and communally. Team spirit helps develop an atmosphere of mutual trust and understanding.

These can be used to initiate and aid the processes of change, organization, decision making, skill management and the overall view of the management function.

Fayol also divided the management function into five key roles:

- To organise
- To plan and forecast (Prevoyance)
- To command
- To control
- To coordinate

3. a) Principles of Organisation

6M

There are some principles which are common to all organisations that are established in a classical form i.e. the form where there is hierarchy of authority and responsibility and it flows downwards. The principles of Organisation offer guidance for the creation of a sound, efficient and effective Organisation structure. In other words, these principles are the sound criteria for efficient organising. They ensure smooth and orderly working of a business enterprise.

1. **Unity of Objectives:** Objectives of the enterprise influence the Organisation structure and hence the objectives of the enterprise should first be decided clearly and firmly. In addition, there should be unity among the objectives decided. This gives clear direction to the whole Organisation and it will be geared for the achievement of such objectives. The Organisation acts as a tool for achieving the objectives. The objectives may be divided into departmental objectives and organizational objectives. There should be unity of objectives as such unity gives one clear direction to the whole Organisation. In addition, objectives should be made clear to all concerned persons so as to enable them to do their best to achieve the objectives.
2. **Division of Work and Specialization:** Division of work leads to specialization. Every department of an Organisation should be given specialized functions. This will raise the overall efficiency and quality of work of an Organisation. At the same time, specialization and departmentation should not have any adverse effect on the total integrated system. Coordination must be established among the departments and activities. Specialization is necessary for raising the efficiency of the whole Organisation structure. The functions given to each department should be preferably only of one category. Employees should be assigned duties to different departments as per their qualifications, qualities and so on.

3. **Delegation of Authority:** There should be proper delegation of authority in every Organisation, particularly in large organisations. The basic idea behind delegation is to see that decision-making power is placed at a proper place. Delegation should go to the lower levels of management. Everyone should be given authority which is adequate to accomplish the task assigned to him. Delegation is useful for getting the things done through others. A successful manager normally does not perform the jobs by himself. He delegates the authority and responsibility to his subordinates. He also motivates his subordinates and see that they take initiative, work efficiently and contribute for achieving organizational objectives.
4. **Coordination:** Organisation involves division of work and departmentation. This naturally suggests the need of proper coordination among the departments and efforts of people working in an Organisation. Due to coordination one clear-cut direction is given to people/ departments and efforts will not be wasted or misdirected. Coordination also brings integration in the basic functions of management. The principle of coordination is important as it facilitates achievement of overall objectives of a business Organisation. It also brings unity of action in the Organisation. Coordination will not be available automatically. For this, working relationships need to be established within the Organisation.
5. **Unity of Command:** Unity of command principle suggests that each subordinate should have only one superior whose command he has to obey. Dual subordination is undesirable as it leads to confusion, disorder, uneasiness and indiscipline. An employee should not have more than one boss to whom he has to report and also function as per his orders and instructions. Reporting to more than one boss leads to confusion.
6. **Flexibility:** According to the principle of flexibility, the Organisation structure should be flexible and not rigid. Such structure is adaptable to changing situations and permits expansion or replacement without any serious dislocation and disruption. There should be an in-built arrangement to facilitate growth and expansion of an enterprise.
7. **Simplicity:** The Organisation structure should be simple for clear understanding of employees. The structure should be easy to manage. Internal communication will be easy due to simplicity of Organisation. The Organisation structure should be simple as far as possible. The levels of management should also be limited.
8. **Span of Control:** The span of control, as far as possible, should be small and fair. This means a manager should not be asked to keep supervision on large number of subordinates. The span of control should be narrow and manageable. It should be properly balanced.
9. **Scalar Principle (Chain of Command):** The principle of chain of command suggests that the line of authority from the chief executive to the first line of superior should be clearly defined. The line of authority should be properly defined so as to avoid any confusion as regards the line of authority. This principle suggests that as far as possible, the chain of authority should be short and should not be broken.
10. **Exception Principle:** The executives at the higher level are busy in important matters and have limited time for the study of routine administrative matters. It is not desirable to take routine matters to the top level managers frequently. Very crucial and exceptionally complex problems should be referred to the top executives and routine matters should be dealt with by the junior executives at the lower levels. Moreover, time of top executives is saved. They can use their time for dealing with more important and complex problems.

11. **Authority and Responsibility:** Authority acts as a powerful tool by which a manager can achieve a desired objective. Authority of every manager should be clearly defined. Moreover, it should be adequate to discharge the responsibilities assigned. The superior should be held responsible for the acts of his subordinates. He cannot run away from the responsibility simply by delegating authority to his subordinates. In fact, the responsibility of the superior for the acts of his subordinates is absolute.
12. **Efficiency:** The Organisation structure should enable the enterprise to function efficiently. This will enable the enterprise to accomplish its objectives quickly and also at the lowest cost. For this, the structure introduced should be suitable to the nature, size, activities etc. of the Organisation. A suitable Organisation structure ensures full and purposeful utilisation of available human and material resources and ensures efficiency.
13. **Proper Balance:** Proper balance is necessary in different aspects of the Organisation. This means there should be reasonable balance in the size and functions of departments, centralisation and decentralisation of the Organisation, span of control, chain of command and finally in between human and material resources. This principle of balance suggests that the top management should see that the vertical and horizontal dimensions of the Organisation are fairly balanced.
14. **Separation of line and staff functions:** Line functions should be separated from the staff functions even when they are supplementary in character. Line functions are directly connected with operations while staff functions are auxiliary to the line functions. These functions should be coordinated when necessary but normally they should be kept separate.

3. b) Distinguish marketing and selling

6M

Marketing	Selling
1. MARKETING is a process of transferring a product or service to a buyer at a competitive price in order to satisfy his or her need”	1. SELLING is a process of transferring a product or service to a buyer at a price regardless of his or her need”
2. Focuses on the needs of the Customer	2. Focuses on the needs of the Producer
3. Marketing makes use of long-term Strategies to get sales	3. Selling makes use of short-term tactics to get sales
4. Customers enjoy supreme importance	4. Product enjoys supreme importance
5. Converts customer needs into products	5. Converting products into cash
6. Profits through customer satisfaction	6. Profits through sales volume

UNIT II

4. a)

6M

METHODS TO MEASURE PRODUCTIVITY

Productivity is an effective tool of judging how a system is performing over a period of time. It is important to measure it quantitatively and the following techniques are used to measure the productivity.

1. MATERIAL PRODUCTIVITY:

There are many industries in which the cost of raw material is in appreciable proportion of cost of finished product. Under such conditions, the productivity of materials becomes a key factor in economic production.

$$\text{Material productivity} = \frac{\text{output}}{\text{Material input}}$$

Raw material productivity can be improved by:

1. Changes in product design
2. Proper training and motivation of workers
3. Better material planning and control
4. Waste reduction and scrap control
5. Search for alternative cheaper materials

2. LABOUR PRODUCTIVITY:

$$\text{Labour or human productivity} = \frac{\text{output}}{\text{Human input}}$$

Output and labour can also be measured in terms of their money value

$$\text{Thus labour productivity} = \frac{\text{Total revenue from production}}{\text{Expenditure on labour}}$$

Labour productivity can be improved by:

1. Providing training to workers to utilize best methods of production.
2. Selection of product design and process of manufacture so as to ensure most economic use of labour
3. Constant motivation of workers by financial and non financial incentives
4. By boosting the morale of employees
5. Improving working conditions in the plant

3. CAPITAL PRODUCTIVITY:

$$\text{Capital productivity} = \frac{\text{Turnover}}{\text{Capital input}}$$

It can be improved by:

1. by careful make or buy decisions
2. Better utilization of capital resources like land, building and machines
3. by adopting modern manufacturing techniques, like flexible manufacturing system, Improved techniques of maintenance and proper plant layout.

4. MACHINE PRODUCTIVITY:

$$\text{Machine productivity} = \frac{\text{output}}{\text{Actual machine hours used}}$$

Machine productivity can be increased by:

1. Preventive maintenance
2. Utilization of proper machining parameters like speed, feed etc
3. Use of requisite skilled and properly trained labour
4. Method study

5. ENERGY PRODUCTIVITY:

$$\text{Energy productivity} = \frac{\text{output}}{\text{Energy input}}$$

4. b) Objectives Of Work Study

6M

- It is a mean for raising productivity of an industry by re-organization of the work, involving little or no capital expenditure.
- It is used to determine the standards of performance on which effective planning and control depends
- It follows a systematic approach which ensures no related factor is overlooked.
- It results in better workplace layout, neat and clean working environment resulting in minimum movement of workers and materials.
- It results in saving and efficient use of human and material resources by increasing output and reducing scrap, rework etc
- It eliminates unnecessary human movements
- Results in improved safety
- Reduction in fatigue and health hazard
- It guides to determine the level of skill in the workers for implementing the incentive based wage system
- It helps to minimize unit cost by proper selection and use of machine, processes.

5. a) Micromotion Study

3M

- It is a technique for recording and timing an activity.
- It consists of taking motion pictures of the operation with a clock in the picture (or with a video camera running at a known speed.
- The film is a permanent record of the method and the time and is always ready to be examined when needed.

Purposes of Micro motion Study

1. To assist in finding the preferred method of doing the work.
2. To assist in training the workers to understand the meaning of motion study and to enable them to apply motion economy principles in a professional way.

Micro motion study as an Aid in Improving Methods

The procedure of making a micro motion study consists of:

1. Filming the operation to be studied.
2. Analysing the film.
3. Charting the results of the analysis.
4. Developing the improved method.

The speed of the camera used ranges from 960 to 1000 frames per minute. But faster cameras may be used to study very fast hand motions or complex operations.

The pictures should be enlarged many times to facilitate the analysis of the motions.

Micro motion study should be used when it is economical to do so (short cycle highly repetitive operations, large volume production, or operation performed by a large number of workers).

Memo motion Study

3M

In memo motion study, the camera speed is at 60 or 100 frames per minute.

In addition to its use in industrial operations, it is used to study many other operations such as check-in operations as airline counters, the manner in which customers select items in the store, traffic flow on highways, and in banks.

It costs less than micro motion study (only costs 6% of the cost of a micro motion study).

5. b) Time Study Procedure

6M

The procedure for time study can best be described step-wise, which are self explanatory.

Step 1: Define objective of the study. This involves statement of the use of the result, the precision desired, and the required level of confidence in the estimated time standards.

Step 2: Verify that the standard method and conditions exist for the operation and the operator is properly trained. If need is felt for method study or further training of operator, the same may be completed before starting the time study.

Step 3: Select operator to be studied if there are more than one operator doing the same task.

Step 4: Record information about the standard method, operation, operator, product, equipment, and conditions on the Time Study observation sheet.

Step 5: Divide the operation into reasonably small elements, and record them on the Time Study observation sheet.

Step 6: Time the operator for each of the elements. Record the data for a few number of cycles on the Time Study observation sheet. Use the data to estimate the total number of observations to be taken.

Step 7: Collect and record the data of required number of cycles by timing and rating the operator.

Step 8: Calculate the representative watch time for each element of operation. Multiply it by the rating factor to get normal time.

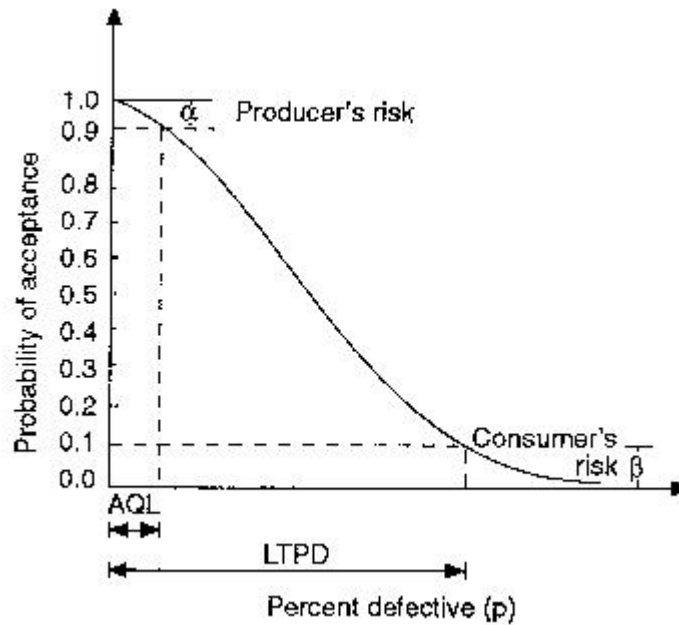
Normal time = Observed time x Rating factor

Calculate the normal time for the whole operation by adding the normal time of its various elements.

Step 9: Determine allowances for fatigue and various delays.

Step 10: Determine standard time of operation.

Standard time = Normal time + allowances



The concepts of the two types of risk are well explained using an operating characteristic- curve. This curve will provide a basis for selecting alternate sample plans. For a given value of sample size (n), acceptance number (C), the O.C. curve is shown in Fig..

In the above figure, percent defective is shown on x-axis. The probability of accepting the lot for a given percent defective is shown on y-axis. The value for percent defective indicates the quality level of the lot inspected. AQL means acceptable quality level. LTPD means lot tolerance percent defectives. These represent quality levels of the lot submitted for inspection. If the quality level of the lot inspected is at AQL or less than AQL, then the customers are satisfied with the quality of the lot. The corresponding probability of acceptance is called $1 - \alpha$. On the other hand, if the quality level is more than or equal to LTPD, the quality of the lot is considered to be inferior from consumer's view point. The corresponding probability of acceptance of the lot is called β . The quality level in between AQL and LTPD is called indifferent zone.

So, we require α , β , AQL and LTPD to design a sample plan. Based on these, one can determine n and C for the implementation purpose of the plan

6. b) Mean and Range charts

An X-bar and R (range) chart is a pair of control charts used with processes that have a subgroup size of two or more. The standard chart for variables data, X-bar and R charts help determine if a process is stable and predictable. The X-bar chart shows how the mean or average changes over time and the R chart shows how the range of the subgroups changes over time. It is also used to monitor the effects of process improvement theories. As the standard, the X-bar and R chart will work in place of the X-bar and s or median and R chart.

An **X-Bar and R-Chart** is a type of statistical process control chart for use with continuous data collected in subgroups at set time intervals - usually between 3 to 5 pieces per subgroup. The

Mean (X-Bar) of each subgroup is charted on the top graph and the Range (R) of the subgroup is charted on the bottom graph. Out of Control points or patterns can occur on either the X-bar or R chart.

To construct an X-Bar and R Chart, follow the process steps below. For subgroup sizes greater than 10, substitute the subgroup standard deviation (S) for range (R), and use constants for S from the table located after the instructional steps.

1. **Record** subgroup observations.
2. **Calculate the average (X-Bar) and range (R)** for each subgroup.
3. **Plot the X-bar and R values** for each subgroup in time series. You can create a meaningful control chart from as few as 6-7 data points, although a larger sample size (20+ subgroups) will provide much more reliability. In most cases, control limits are not calculated until at least 20 subgroups of data are collected.
4. **Calculate the average R value**, or R-bar, and plot this value as the centerline on the R chart.
5. Based on the subgroup size, select the appropriate constant, called D_4 , and multiply by R-bar to **determine the Upper Control Limit** for the Range Chart.

All constants are available from the reference table.

$$UCL(R) = R\text{-bar} \times D_4$$

Plot the Upper Control Limit on the R chart.

6. If the subgroup size is between 7 and 10, select the appropriate constant, called D_3 , and multiply by R-bar to **determine the Lower Control Limit** for the Range Chart. There is no Lower Control Limit for the Range Chart if the subgroup size is 6 or less.

$$LCL(R) = R\text{-bar} \times D_3$$

Plot the Lower Control Limit on the R chart.

7. Using the X-bar values for each subgroup, **compute the average of all X bars**, or X-bar-bar (also called the Grand Average). Plot the X-bar-bar value as the centerline on the X Chart.

8. **Calculate the X-bar Chart Upper Control Limit**, or upper natural process limit, by multiplying R-bar by the appropriate A_2 factor (based on subgroup size) and adding that value to the average (X-bar-bar).

$$UCL(X\text{-bar}) = X\text{-bar-bar} + (A_2 \times R\text{-bar})$$

Plot the Upper Control Limit on the X-bar chart.

9. **Calculate the X-bar Chart Lower Control Limit**, or lower natural process limit, for the X-bar chart by multiplying R-bar by the appropriate A_2 factor (based on subgroup size) and subtracting that value from the average (X-bar bar).

$$LCL(X\text{-bar}) = X\text{-bar-bar} - (A_2 \times R\text{-bar})$$

Plot the Lower Control Limit on the X-bar chart.

10. After constructing the control chart, follow the same rules to **assess stability** that are used on XmR charts.

7. a) Functions of Human Resource Management (HRM):

6M

Broadly speaking, experts have generally classified the functions into two major categories, i.e. managerial and operative functions. Others has classified functions as general and specific functions, and yet others as 'personnel Administration functions and Industrial Relations Functions'. Functions have also been classified on the basis of the capacities; or on the basis of authority.

Managerial functions:

“Management is a multi-purpose organ which has these jobs, two of which are directly related to personnel managing a business. ‘Managing managers’ and managing workers and the work.

In our view management may be thought of as the process of allocating an organizations inputs (human and economic resources) by planning, organizing, directing and controlling for the purpose of producing outputs (goods and services) desired by its customers so that organization objectives are accomplished. In the personnel in an ever-changing business environment. Definition is very dynamic.

Planning: Is a pre-determined course of action. According to Allen, “it is a trap laid to capture the future.” Terry is of the view the “planning is the foundation of most successful actions of an enterprise.” Planning is the determination of the plus, strategies, programs, policies, procedures, and standard needs to accomplish the desired organization objectives. In fact “planning today avoids crisis tomorrow.’ They bridge a gap between where they are and where they want to go.

Organizing: After a course of action has been determined an organization should be established to carry it out. An organization is a structure, a framework and a process by which a cooperative group of human beings allocate its tasks among its members, identifies relationships and integrates its activities towards common objectives.

Directing (Motivating, Actuating or commanding): Directing the subordinates at any level is a basic function of the managerial personnel. Directing is involved with getting persons together and asking them (either through command or motivation) to work willingly and effectively for the achievement of designated goals. Directing deals not only with the dissemination of orders within an organization units and departments, but also with the acceptance and execution of these orders by the employees.

Coordinating and controlling: Coordinating refers to balancing timing and integrating activities in an organization. So that a unity of action in pursuit of a common purpose in achieved. Coordination in the management of personnel takes place at all levels, from the top management through to the supervisor and those for whom he is responsible.

The personnel dept has to coordinate the tasks of developing, interpreting, and reviewing personnel policies, practices and programs, such as safety programs, employee benefits, job evaluation, training or development, and communication.

Controlling is the art of checking regulating and verifying whether everything occurs in conformity with the plan that has been adopted, the instructions issued and the principles established. It is greatly concerned with actions and remedial actions. By check, analysis, and review, the personnel dept assists in realizing the personnel objectives.

Operative functions:

The operating functions of personnel management are concerned with the activities specifically dealing with procuring, developing, compensating and maintaining an efficient workforce.

1. **The procurement** is concerned with the obtaining of a proper kind and number of personnel necessary to accomplish an organization’s goals. It deals with specifically with such subjects as the determination of manpower requirements their recruitment, selection and place (comprising activities to screen and hire personnel, including application forms, psychological test, interviews, medical check-up reference calling), induction follow up, transfers, layoffs, discharge and separation etc.

2. **The development** is concerned with the personnel development of employees by increasing their skill through training so that job performance is properly achieved. Drafting and directing training programmes for all levels of employees, arranging for their on-the-job, office and vestibule training, holding seminar and conferences providing for educational and

Vocational counseling and appraising employee potential and performance are undertaken under this function.

3. The **compensating** is concerned with securing adequate and equitable remuneration to personnel for their contribution to the attainment of original objectives. Functions related to wage surveys, establishment of

Job classifications, job descriptions and job analyses, merit ratings, the establishment of wage rates and wage structure, wage plans and policies, wage system, incentives and profit sharing plans etc. full under this category.

4. **The integration function:** after the employee has been procured, his skill and ability developed and monetary compensation determined, the most important,

Yet difficult of the personal management is to bring about an “integration” of human resources with organization, and to cope with inevitable reconciliation of individual, societal, and organization interests. It rests upon the premise that significant overlapping of interests do exist in the organization in such programmes as job enlargement, job evaluation, variable compensation plans. The greater they overlap, the more productivity would coincide with employees that they would prefer to avoided assignment to narrow and respective tasks, meeting high output standards, acceptance of managerial decisions. For this reason, the organization has disciplinary action programmes as well as some freedom to do away with the services of particular employees. On the other hand, there are certain things that employees desire which the organization is reluctant to provide e.g. increased wages; totally, safe working conditions time off with pay, shorter hours of work, premium pay for overtime work etc.

5. **The maintenance function** deals with sustaining and improving the conditions that have become established. Specific problems of maintaining the physical conditions of employees (health and safety measures) and employee service programmes are the responsibility of the personnel department.

7. b) Wage incentive plans

6M

- Incentive means encouragement or inducement or reward to any person for putting this best efforts to achieve higher level of quality production. Permanent employees, in a well established organization, tend to loose interest in productivity. Their jobs are secured, so why should they bother for production. The production will decrease on the pretext of lost time due to minor faults in a machine/equipment/tools/materials etc. There may be minor delays due non-co-ordination of feeding of raw materials or in process materials. Once a part of employee's earnings are related to his output, the employee will take initiative to overcome all these
- minor problems and will try to achieve higher level of performance by putting extra efforts & skill

Straight Piece Rate Plan- If the standard time for a particular job/ operation is 1 hour, the production per shift/day of eight hours will be eight pieces. Decide average earnings per day to perform the job requiring particular skill, education & experience. Say it is Rs 100. Now the piece rate for the job will be Rs. $100/8 = \text{Rs } 12.5$. If a worker has produced 9 pieces, his earning for that day will be $12.5 \times 9 = \text{Rs. } 112.5$. On the other hand, if he has produced only 7 pieces his earning will be $12.5 \times 7 = \text{Rs } 87.5$.

This scheme is very easy to follow. The increase in production is rapid. Minimum wages are not guaranteed, so it is the prime responsibility of management to provide sufficient materials, tools, power, machines & equipment.

Advantages:

1. It provides direct incentive for increased output
2. It is easy to understand and calculate

Taylor's differential piece rate system: This system was introduced by Taylor, the father of scientific management. This system introduced to penalize a slow worker by paying him a low piece rate for low production and to reward an efficient worker by giving him a higher piece rate for a higher production.

Thus if a worker completes the work within or less than the standard time, he is paid a higher piece rate and if he does not complete the work within the standard time, he is given a lower piece rate

Advantages:

1. The system is easy to understand
2. It provides greater incentive to efficient workers and penalizes the inefficient ones
3. The worker is not required to be paid for idle time

Merricks multiple piece rate: Under this method, three piece rates are applied for workers with different levels of performance. Wages are paid at ordinary piece rate to those workers whose performance is less than 83% of the standard output. 110% piece rate is given to workers whose performance is between 83% and 100% of standard. 120% of ordinary piece rate is given to those workers who produce more than 100% of the standard output.

Gantt task and bonus plan: This plan is based on careful time and motion study. A standard time is fixed for doing a particular job, worker's actual performance is compared with the standard time and his efficiency is determined. If a worker takes more time than the standard time to complete the job (Below 100%) he is given wages for the time taken by him and if a worker takes the standard time to perform job (100% efficiency), he is given wages for the standard time and bonus of 20% of wages earned. If the worker takes less time than the standard time his efficiency is more than 100% and he is given wages for the actual time and bonus at the rate of 20%.

Halsey incentive plan:

The Halsey plan was introduced by Fredrick. Halsey, an american engineer in 1891. In this system a minimum wage is guaranteed to the workers. A standard time is fixed for the performance of each job. If a worker completes his job before the standard time, he gets Guaranteed wage plus incentive bonus at fixed percentage of earnings for the time saved. The most common percentage is 50 percent.

Let hourly rate(R_s) = R

standard time (Hrs) = T_s

Time actually taken (Hrs) = T_a

Time saved (Hrs) = $T_s - T_a$

Bonus earned = $(T_s - T_a) \times 50/100 \times R = \frac{1}{2} R (T_s - T_a)$

Wages earned by the worker = $T_a \times R + \frac{1}{2} R (T_s - T_a)$

UNIT IV**8. a) Functions of Entrepreneur****6M**

1. He manages business and takes decisions
2. He studies the market and selects the business
3. He makes a selection of plant size
4. He selects plant site
5. He organizes sales and holds the customers
6. He promotes new inventions
7. He coordinates different factors of production
8. He arranges raw material, machinery and finance
9. He employs laborers
10. He deals with government departments such as sales tax, labour, electricity, export-import, railways.
11. He decides pricing policies
12. He Distributes wages of labourers, interest to the capitalist.

8. b) Role of communication in entrepreneurship**6M**

Communication has a pivotal role to play in the development of an entrepreneurial society. It will open vast information activities that will create the necessary climate for entrepreneurial development. This will open up new opportunities otherwise inaccessible to ordinary entrepreneurs.

• Communication plays a vital role even to small enterprise, where control by one person makes interpersonal communication of the essence. Many businesses fail simply because partners would not talk with each other. Interpersonal communication is important for an entrepreneur. Here's how communication really helps an entrepreneur.

- Essential in marketing and sales promotion. An entrepreneur should develop a marketing strategy for his product or service. He must be familiar with basic advertising strategies and packaging his product.
- Important in communicating with employees and other partners. Communication is a vital component in all stages of the business production process. A breakdown may occur because the employer may not be clear on the message he wishes to convey due to lack of information while the message is not understood by the receiver. The challenge is in getting the message across and that needs skills specifically communication skills.

9. a) Objectives of Entrepreneurial development

6M

1. To develop and strengthen the entrepreneurial characteristics
2. To analyse industrial environment concerned with small scale industry and small business enterprises
3. To select the product to be manufactured
4. Formulate project reports
5. To analyse and understand the procedure for establishing the small enterprises
6. To provide support required for launching the enterprise
7. To acquire basic management skills needed
8. To appreciate the social responsibilities
9. To let the entrepreneur set the objectives of his business
10. To prepare the entrepreneur to accept moderate risks
11. To take strategic decisions
12. To develop communication skills

9. b) Process design

3M

It is concerned with the overall sequence of operations required to achieve the product specifications

Steps in Process Design

1. Determine the method of manufacturing
2. Establish the sequence and type of operations involved
3. Select the tools and equipment required
4. Analyze how the manufacturing of the product will fit into the facilities

Steps involved in Plant Design

3M

- Raw material selection.
- Block diagram of the process.
- Material and Energy balance of the process.
- Equipment selection.
- Piping drawings, instrument drawings, electrical and civil drawings.
- Layout drawings.
- Utility section equipment capacity calculation based on energy requirement found by energy balance.

- Individual equipment drawings and flow sheet.
- Blue print of complete process.
- HAZOP and safety studies (safety interlock systems).
- redesigning of the process flow sheet.
- Construction of the civil structures.
- Equipment installation and commissioning
- Leak and pressure tests of the equipment and pipe lines.
- Instruments and controller installation, calibration.
- Trail run with water and then with air.
- purging the process equipments.
- Validation runs are taken for stabilization of the process.