

II/IV B.Tech Degree Examination (AUGUST 2023)
Solution and Scheme Evaluation for
INDUSTRIAL ENGINEERING AND MANAGEMENT
Mechanical Engineering
(20ME405)

Prepared by:

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II/IV B.Tech (Regular/Supplementary) DEGREE EXAMINATION

July/August, 2023

Mechanical Engineering

Fourth Semester

Industrial Engineering & Management

Time: Three Hours

Maximum: 70 Marks

Answer question 1 compulsory.

(14X1 = 14Marks)

Answer one question from each unit.

(4X14=56 Marks)

		CO	BL	M
1	a) What is the need of industrial engineering.	CO1	L1	1M
	b) How do you calculate productivity.	CO1	L1	1M
	c) What is the scope of method study.	CO1	L1	1M
	d) What are the characteristics of management.	CO2	L1	1M
	e) What is the role of top level management.	CO2	L1	1M
	f) What are the three key elements of motivation.	CO2	L1	1M
	g) Mention any two tasks of marketing manager.	CO3	L1	1M
	h) Define working capital.	CO3	L1	1M
	i) What are the two basic important questions are associated with inventory control.	CO4	L1	1M
	j) Define lead time in inventory control.	CO4	L1	1M
	k) What are the assumptions in basic inventory model.	CO4	L1	1M
	l) What is time study.	CO1	L1	1M
	m) List out the methods to measure productivity.	CO1	L1	1M
	n) What motivative an employee in any organization.	CO2	L1	1M
<u>Unit-I</u>				
2	a) Discuss the factors influencing productivity.	CO1	L2	7M
	b) Discuss the measures to improve productivity.	CO1	L2	7M
(OR)				
3	a) List out the advantages of work study.	CO1	L1	7M
	b) Discuss the various steps involved in time study.	CO1	L2	7M
<u>Unit-II</u>				
4	a) Explain functions of management.	CO2	L5	7M
	b) Distinguish between Line organization, Line and staff organization structures.	CO2	L4	7M
(OR)				
5	a) Elaborate the roles and skills of a manager.	CO2	L5	7M
	b) Explain any TWO motivation theories.	CO2	L5	7M
<u>Unit-III</u>				
6	a) Explain the concept of distribution channels necessity in marketing management.	CO3	L5	7M
	b) Describe the various stages of product life cycle.	CO3	L2	7M
(OR)				
7	a) Explain the goals of finance function.	CO3	L5	7M
	b) Write the various items in the format of profit and loss account.	CO3	L3	7M
<u>Unit-IV</u>				
8	a) Derive an expression for EOQ with assumptions.	CO4	L5	7M
	b) Enumerate benefits, limitations, and challenges of ABC analysis.	CO4	L5	7M
(OR)				
9	a) What are the determinants of quality and justify.	CO4	L5	7M
	b) Elaborate the components of total quality.	CO4	L5	7M

1 a. Drawing on the physical and social sciences, industrial engineering is important to both producers and end-users of a product. Industrial engineers improve processes and designs to make things more efficient. This is good for business as it saves time and money, raw resources, energy and manpower.

b. A labor productivity index can be calculated by dividing an index of output by an index of hours worked. When more than one index is included in a calculation, all the indexes must have the same base period. Average annual percent changes measure change over several periods stated at an average yearly rate.

c. The task of work simplification and compatible work system design concerns the followings: (i) Layout of shop floor and working areas or work stations. (ii) Working conditions i.e. ergonomics etc. (iv) Tooling and equipment used.

d. Goal-oriented., Pervasive, Multi-dimensional, Continuous process., Group activity., Dynamic function.,Intangible force.

e. A top-level manager is responsible for creating and implementing organizational plans and policies and is a professional who is at the executive level.

f. activation, persistence, and intensity.

g. Oversee all marketing campaigns for their company or department.
Implement strategy.

h. The capital of a business which is used in its day-to-day trading operations, calculated as the current assets minus the current liabilities.

i. (i) How to time the placement of order?

(ii) How to complete order in time with control of process of production?

j. In general, lead time in inventory management is the amount of time between when a purchase order is placed to replenish products and when the order is received in the warehouse.

k. The inventory costs are assumed in EOQ to be constant. The delivery of the ordered inventory takes place in one go. The total ordering cost shall remain constant. The total units, whose consumption is to take place, are certain.

l. Time study is a structured process of directly observing and measuring human work using a timing device to establish the time required for completion of the work by a qualified worker when working at a defined level of performance.

m. (i) Concentrating on profits. (ii) Getting the job done.

n. The way your employees feel about their job and their workplace determines how motivated they are. There is a clear link between job satisfaction and productivity. Job satisfaction depends partly on tangible rewards - for example, how much a person is paid and what benefits they receive.

Unit-I

2. a) Increased Employee Engagement, Increased Productivity, Enhanced Job Satisfaction, Improved Customer Satisfaction, Improved business outcomes

10 Factors affecting productivity at Modern Workplaces

Goal setting software

Clear goals and objectives

Performance management

Positive work environment

Adequate resources

Effective communication

Training and development

Work-life balance

Employee engagement and recognition

Health and well-being

Leadership and management

b) Review goals daily (or at least regularly)

Minimize time-wasting activities.

Use productivity apps.

Motivate your team.

Avoid multitasking.

Offer a wellness program.

Each point explanation is required.

(OR)

3a) Increase in production efficiency.

Higher levels of production and optimum utilization of resources.

Efficient flow of material and products.

Efficient handling of material and better layout.

Decreased cost of production as times spend on the job is decreased.

b) To do this, take the length of time you observed and multiply by it by the rating of the employee's speed. This will give you the average time for each step. From here, add the value of the average times of each step together to arrive at the average time for the entire assembly.

1. Choose the Tasks and Processes to Study

2. Determine the Number of Cycles to Study

3. Choose Eligible Workers

4. Explain the Time Study Details to Your Team Members

5. Have an Observer Analyze Individual Tasks

6. Analyze Workers' Performance

7. Use Your Data To Calculate Standard Time

Unit-II

4

a) 1.Planning

It is the basic function of management. It deals with chalking out a future course of action & deciding in advance the most appropriate course of actions for achievement of pre-determined goals.

According to KOONTZ, "Planning is deciding in advance - what to do, when to do & how to do. It bridges the gap from where we are & where we want to be".

Planning is determination of courses of action to achieve desired goals. Thus, planning is a systematic thinking about ways & means for accomplishment of pre-determined goals.

2.Organizing

It is the process of bringing together physical, financial and human resources and developing productive relationship amongst them for achievement of organizational goals.

Organizing as a process involves:

Identification of activities.

Classification of grouping of activities.

Assignment of duties.

Delegation of authority and creation of responsibility.

Coordinating authority and responsibility relationships.

Know more about - Organizing Function of Management

3.Staffing

It is the function of manning the organization structure and keeping it manned. Staffing has assumed greater importance in the recent years due to advancement of technology, increase in size of business, complexity of human behavior etc.

Staffing involves:

Manpower Planning (estimating man power in terms of searching, choose the person and giving the right place).

Recruitment, Selection & Placement.

Training & Development.

Remuneration.

Performance Appraisal.

Promotions & Transfer.

Know more about - Staffing Function of Management

4.Directing

It is that part of managerial function which actuates the organizational methods to work efficiently for achievement of organizational purposes.

It is considered life-spark of the enterprise which sets it in motion and action of people, because planning, organizing and staffing are the mere preparations for doing the work.

Direction is that inter-personnel aspect of management which deals directly with influencing, guiding, supervising, motivating sub-ordinate for the achievement of organizational goals. Direction has following elements:

Supervision
Motivation
Leadership
Communication

5. Controlling

It implies measurement of accomplishment against the standards and correction of deviation if any to ensure achievement of organizational goals.

According to Theo Haimann, “Controlling is the process of checking whether or not proper progress is being made towards the objectives and goals and acting if necessary, to correct any deviation”.

Therefore controlling has following steps:

Establishment of standard performance.

Measurement of actual performance.

Comparison of actual performance with the standards and finding out deviation if any.

Corrective action.

b) The main difference between line and line staff organizations lies in their structure and roles. While a line organization follows a strict hierarchy and focuses on achieving primary goals, a line-staff organization combines both line and functional structures and places a greater emphasis on expertise and support.

Therefore, it is important to understand the difference between line and line staff organizations to determine which structure is best suited for an organization's needs. Depending on the goals, objectives, and expertise required, either a line or line-staff organization may be more effective. Understanding the difference between line and line staff organizations can help organizations choose the most appropriate structure to achieve success.

Line Organization	Line Staff Organization
1. Clear chain of command	1. Specialized support functions
2. Decisions made by top management	2. Decisions made by staff experts
3. Directly involved in production	3. Not directly involved in production
4. Clear authority and responsibility	4. Limited authority and responsibility
5. Focus on achieving goals	5. Focus on providing support and advice

(OR)

5 a) As a spokesperson sub-role, a manager is responsible for transmitting information to people outside of the organization. The third role is the decisional role. Within that, a manager must be an entrepreneur, disturbance handler, resource allocator, and negotiator.

There is a long list of skills that a manager should possess, but they can be consolidated into three main categories: conceptual skills, human skills, and technical skills. Conceptual skills are the ability of a manager to see the organization as a whole and how each of the functions of the organization works in concert to achieve organizational goals. They also involve being able to identify where the organization fits in its competitive environment and ultimately the value that the organization creates for the customer. Conceptual skills include long term outlook and the ability to think strategically. Conceptual skills are most important for top management.

b)

1. Maslow's Theory of Hierarchical Needs

Abraham Maslow postulated that a person will be motivated when all his needs are fulfilled. People do not work for security or money, but they work to contribute and to use their skills. He demonstrated this by creating a pyramid to show how people are motivated and mentioned that **ONE CANNOT ASCEND TO THE NEXT LEVEL UNLESS LOWER-LEVEL NEEDS ARE FULFILLED**. The lowest level needs in the pyramid are basic needs and unless these lower-level needs are satisfied people do not look at working toward satisfying the upper-level needs.

Below is the hierarchy of needs:

- **Physiological needs:** are basic needs for survival such as air, sleep, food, water, clothing, sex, and shelter.

- **Safety needs:** Protection from threats, deprivation, and other dangers (e.g., health, secure employment, and property)
- **Social (belongingness and love) needs:** The need for association, affiliation, friendship, and so on.
- **Self-esteem needs:** The need for respect and recognition.
- **Self-actualization needs:** The opportunity for personal development, learning, and fun/creative/challenging work. Self-actualization is the highest-level need to which a human being can aspire.

2. Herzberg's two-factor Theory

Herzberg classified the needs into two broad categories; namely hygiene factors and motivating factors:

- poor hygiene factors may destroy motivation but improving them under most circumstances will not improve team motivation
- hygiene factors only are not sufficient to motivate people, but motivator factors are also required

Herzberg's two-factor principles		
Influenced by Hygiene Factors (Dissatisfiers)	Improving motivator factors increases job satisfaction	Influenced by motivator factors (Satisfiers)
<ul style="list-style-type: none"> • Working condition • Coworker relations • Policies & rules • Supervisor quality 	Improving the hygiene factors decreases job dissatisfaction	<ul style="list-style-type: none"> • Achievements • Recognition • Responsibility • Work itself • Personal growth

Unit-III

6a) A distribution channel is the path from production to consumption. It ensures products reach customers and generates sales and brand awareness. The network has producers, wholesalers, retailers, and consumers. It affects product prices.

A distribution channel is a way a product gets to the buyer. Marketing distribution channels are the ways brands get their products to customers. Efficiency and cost-effectiveness are priorities in choosing them. Channels are companies that analyze the market, promote products, and negotiate with customers.

It can be short or long, depending on the intermediaries needed.

A distribution channel is the path from production to consumption.

It ensures products reach customers and generates sales and brand awareness.

The network has producers, wholesalers, retailers, and consumers.

It affects product prices.

It includes middlemen such as wholesalers, retailers, distributors, or the Internet.

Functions include supplying market information. Managing financial operations. While promoting products, maintaining prices, and minimizing risk.

b) A product's life cycle is usually broken down into four stages; introduction, growth, maturity, and decline. Product life cycles are used by management and marketing professionals to help determine advertising schedules, price points, expansion to new product markets, packaging redesigns, and more.

Introduction Stage

At the Introduction (or development) Stage market size and growth is slight. It is possible that substantial research and development costs have been incurred in getting the product to this stage. In addition, marketing costs may be high in order to test the market, undergo launch promotion and set up distribution channels. It is highly unlikely that

companies will make profits on products at the Introduction Stage. Products at this stage have to be carefully monitored to ensure that they start to grow. Otherwise, the best option may be to withdraw or end the product.

Growth Stage

The Growth Stage is characterized by rapid growth in sales and profits. Profits arise due to an increase in output (economies of scale) and possibly better prices. At this stage, it is cheaper for businesses to invest in increasing their market share as well as enjoying the overall growth of the market. Accordingly, significant promotional resources are traditionally invested in products that are firmly in the Growth Stage.

Maturity Stage

The Maturity Stage is, perhaps, the most common stage for all markets. It is in this stage that competition is most intense as companies fight to maintain their market share. Here, both marketing and finance become key activities. Marketing spend has to be monitored carefully, since any significant moves are likely to be copied by competitors. The Maturity Stage is the time when most profit is earned by the market as a whole. Any expenditure on research and development is likely to be restricted to product modification and improvement and perhaps to improve production efficiency and quality.

Decline Stage

In the Decline Stage, the market is shrinking, reducing the overall amount of profit that can be shared amongst the remaining competitors. At this stage, great care has to be taken to manage the product carefully. It may be possible to take out some production cost, to transfer production to a cheaper facility, sell the product into other, cheaper markets. Care should be taken to control the amount of stocks of the product. Ultimately, depending on whether the product remains profitable, a company may decide to end the product.

(OR)

7a) The main objective of financial management is to maximize shareholder's wealth and minimize the cost of capital. Finance manager should analyse the debt equity in the short term and long term. This depends on the capital the firm owns and the amount needed to be raised from extra source.

THE FUNCTIONS OF FINANCE MANAGER

The following are the major functions of a finance manager:-

1. ESTIMATE THE FUND REQUIRED

Primary duty of a finance manager is to find out the fund required for a particular period of time. While calculating the required fund finance manager has to consider fund requirement of both long term and short term requirements. He has to consider the policies of the organization also.

2. FORMATION OF CAPITAL STRUCTURE

The main objective of financial management is to maximize shareholder's wealth and minimize the cost of capital. Finance manager should analyse the debt equity in the short term and long term. This depends on the capital the firm owns and the amount needed to be raised from extra source. Under this function decisions have to be made regarding the type and proportion of different sources of fund. Finance manager should select suitable capital structure considering various factors.

3. EVALUATE AND SELECT SOURCE OF FUND

Many options are available to raise fund, Finance manager should select options which will provide higher earning possibility in less costs.

4. ALLOCATION OF FUND

Finance manager has to determine the fund required for each financial segment and should distribute fund accordingly.

5. DISTRIBUTION OF PROFIT

Under this function management decides whether to distribute the profit earned or retained it for future use. Management can take appropriate decisions as per their discretion considering various relevant facts.

6. FINANCIAL CONTROL

This is one of the key activities in finance management. Finance manager has to assess whether an organization is meeting its obligations or not, any flaws in the decision will affect the overall strategy. Finance manager should consistently monitor the financial activities and should ensure its compliance with pre-determined objectives.

b)

Particulars	Amount	Particulars	Amount
To Gross loss b/d		To Gross profit b/d	
Management expenses:		Income:	
To salaries		By Discount received	
To office rent, rates, and taxes		By Commission received	
To printing and stationery		Non-trading income:	
To Telephone charges		By Bank interest	
To Insurance		By Rent received	
To Audit fees		By Dividend received	
To Legal charges		By Bad debts recovered	

To Electricity charges	Abnormal gains:
To Maintenance expenses	By Profit on sale of machinery
To Repairs and renewals	By Profit on sale of investments
To Depreciation	By Net Loss
(transferred to Capital A/c)	
Selling distribution expenses:	
To Salaries	
To Advertisement	
To Godown	
To Carriage outward	
To Bad debts	
To Provision for bad debts	
To Selling commission	
Financial expenses:	
Bank charges	
Interest on loan	
Discount allowed	
Abnormal losses:	
To Loss on sale of machinery	
To Loss on sale of investments	
To Loss by fire	
To Net Profit	
(transferred to capital a/c)	

Unit-IV

8a) Total Cost = Ordering Cost + Carrying Cost --- (1)

Let us look at both the components theoretically. Later in this article, we elaborate what actually constitutes ordering and carrying costs from the organization perspective. For now, we'll stick to formulas.

Ordering Cost

Ordering Cost = Number of orders per year x Cost per order (K)

Number of orders per year = Annual demand (D) / Ordering Quantity (Q)

$$\text{Hence Ordering Cost} = \left(\frac{D}{Q} \times K \right)$$

Carrying Cost

Carrying Cost = Average Inventory (in \$) over the year x Inventory Carrying Costs (h)

Average Inventory (in units) = (Q/2)

Average Inventory (in dollar) = (Q/2) x c

[Because we are ordering Q units at a time and it uniformly depletes to zero as the inventory is consumed. Hence, the average inventory is (Q+0)/2]

$$\text{Carrying Cost} = \left(\frac{Q}{2} \right) \times c \times h$$

Let's put back these numbers in total cost equation (1)

$$\text{Total Cost (TC)} = \left[\left(\frac{D}{Q} \right) \times K \right] + \left[\left(\frac{Q}{2} \right) \times c \times h \right]$$

$$Q = \sqrt{\frac{2DK}{ch}}$$

b) ABC Analysis classifies inventory items into three categories based on their value and importance to the business: A (high-value items), B (medium-value items), and C (low-value items).

The A items — typically the most expensive and most important — should be managed with extra care and attention. The B items are also important for the business's success, but not as much as A. The C items are not as important for the business's success.

Advantages of ABC Analysis

- It allows businesses to focus attention on the most important items. By focusing on A items, businesses can ensure that they are properly managed and stocked. This helps to ensure that the business has the items it needs when it needs them.
- It helps businesses save money. By focusing on the A items, businesses can save money by not wasting resources on managing and stocking unimportant items.
- ABC analysis provides businesses with greater control over their inventory. By focusing on the A items, businesses can better manage their inventory levels and avoid stock outs.
- It helps businesses make better decisions. By understanding which items are more important, businesses can make better decisions about which items to stock and how to manage them.

Limitations

Difficult to Implement:

The process requires detailed data on the items being analyzed, and it can be time-consuming to gather and analyze the data. Additionally, it can be difficult to determine which items should be classified as “A”, “B”, or “C”.

Doesn't Consider Demand Patterns:

This means that items may be classified as “A” even if they do not have high demand. This can lead to inefficient inventory management and missed sales opportunities.

(OR)

9

a) Determinants of quality • Quality of design – Determine what its customers wants after identifying the customers.

Quality capability of production processes. Quality of conformance • Quality of customer service. Organization quality culture.

1. Design: By design we refer to the intention of the product.

2. Quality of conformance: After producing it that product matches with the design, and then we can call it at quality of conformance.

3. Ease of use: It means that how easily the product can be used. It is another intention of the producer. Object is that now easily consumer can use the product. Instruction must be given with the product. So, for ensuring the proper use of product instruction must be provided.

4. Service after delivery: Company should provide proper service after sell service. Company should have a HR department which will work for customer who are using their product or wish to buy their product. Customer may need information about the product that they want to buy. Or the existing consumer may need to get information because of problem about the problem. Then HR department will conduct with them. HR department plays a vital role to retain the customers. And this is also included of the quality of the product.

b) It has four main components: quality planning, quality assurance, quality control and quality improvement. It does not only focus on product and service quality, but also on the means to achieve it.

Quality management ensures that an organization, product or service is consistent. It has four main components: quality planning, quality assurance, quality control and quality improvement. It does not only focus on product and service quality, but also on the means to achieve it. Quality management uses quality assurance and control of processes as well as products to achieve more consistent quality.

The dynamic changes taking place in the retail market are resulting in a less space for retailers to differentiate in terms of product assortment, prices and quality since they all offer the same and opening more space for them to differentiate in terms of service excellence.

The success of the business is now more related to quality improvement. In retail, quality is related to all the shapes and characteristics of locations, assortments

The multi perspectives can be an advantage for organizations as depending on a single definition might lead to problems. Today, TQM concept is the most comprehensive; it has emerged into the main stream of organizations and became a function like any other activity like marketing or commercial.