PVP 23

Code: 23HS1402

II B.Tech - II Semester – Regular / Supplementary Examinations
APRIL 2026

INDUSTRIAL MANAGEMENT
(MECHANICAL ENGINEERING)

Duration: 3 hours Max. Marks: 70

Note: 1. This question paper contains two Parts A and B.
2. Part-A contains 10 short answer questions. Each Question carries 2 Marks.
3. Part-B contains 5 essay questions with an internal choice from each unit. Each Question carries 10 marks.
4. All parts of Question paper must be answered in one place.

BL – Blooms Level CO – Course Outcome

PART – A

		BL	CO
1.a)	Explain the objectives of Industrial Engineering.	L2	CO1
1.b)	Discuss the factors governing plant location.	L2	CO1
1.c)	Explain the objectives of work study.	L2	CO2
1.d)	Explain the steps involved in time study.	L2	CO2
1.e)	Discuss the objectives of SQC.	L2	CO2
1.f)	Explain the principles of TQM.	L2	CO2
1.g)	Explain the main objectives of financial management.	L2	CO3
1.h)	Discuss the advantages of NPV method.	L2	CO3
1.i)	Explain the objectives of HRM.	L2	CO3
1.j)	Describe Supply Chain Management (SCM).	L2	CO3

PART – B

			BL	CO	Max. Marks
UNIT-I					
2	a)	Discuss the role and responsibilities of an Industrial Engineer in an organization.	L2	CO1	5 M
	b)	Explain advantages and disadvantages of plant layout.	L2	CO1	5 M
OR					
3	a)	Explain the functions of Management with suitable examples.	L2	CO1	5 M
	b)	Discuss the applications of different types of plant layouts.	L2	CO1	5 M
UNIT-II					
4	a)	Describe the steps involved in conducting method study.	L2	CO2	5 M
	b)	Discuss the advantages and limitations of time study.	L2	CO2	5 M
OR					
5	a)	Discuss the applications and advantages of work study in an organization.	L2	CO2	5 M
	b)	Define time study and explain its objectives.	L2	CO2	5 M
UNIT-III					
6	a)	Define SQC and explain its importance in industry.	L2	CO2	5 M
	b)	Explain the zero defect concept and its importance.	L2	CO2	5 M

OR					
7	a)	Explain the construction and application of $\bar{X}$ and R control charts.	L2	CO2	5 M
	b)	Discuss applications of TQM in manufacturing and service industries.	L2	CO2	5 M
UNIT-IV					
8	a)	Discuss the importance of working Capital Budget.	L2	CO3	5 M
	b)	Describe the various investment evaluation techniques.	L2	CO3	5 M
OR					
9	a)	Explain the estimation of working capital requirements.	L2	CO3	5 M
	b)	Define capital budgeting and explain its importance.	L2	CO3	5 M
UNIT-V					
10	a)	Define job evaluation and explain its importance.	L2	CO3	5 M
	b)	Explain the concept and objectives of Value Engineering.	L2	CO3	5 M
OR					
11	a)	Describe quantitative methods of merit rating.	L2	CO3	5 M
	b)	Discuss the applications of value engineering in industry.	L2	CO3	5 M

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PRASAD V. POTLURI SIDDHARTHA INSTITUTE OF TECHNOLOGY (AUTONOMOUS)
II B.Tech – II Semester – Regular / Supplementary Examinations
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INDUSTRIAL MANAGEMENT
(MECHANICAL ENGINEERING)

1.a) Explain the objectives of Industrial Engineering. 2MARKS

- Increase productivity and efficiency
- Reduce production cost
- Optimize use of resources (men, machines, materials)
- Improve quality of products
- Ensure better working conditions
- Simplify methods and processes

1.b) Discuss the factors governing plant location. 2MARKS

- Availability of raw materials
- Availability of labor
- Transportation facilities
- Nearness to market
- Power and water supply
- Government policies and taxes
- Climate and environmental conditions

1.c) Explain the objectives of work study. 2MARKS

- Improve productivity
- Reduce unnecessary work
- Standardize methods
- Better utilization of resources
- Reduce fatigue of workers

1.d) Explain the steps involved in time study. 2MARKS

- Select the job
- Break job into elements
- Record time for each element
- Calculate average time
- Apply rating factor
- Add allowances
- Determine standard time

1.e) Discuss the objectives of SQC . 2MARKS

- Maintain product quality
- Detect defects early
- Reduce variation in process
- Improve production efficiency
- Reduce inspection cost

1.f) Explain the principles of TQM . 2MARKS

- Customer focus
- Continuous improvement
- Employee involvement
- Process-centered approach
- Integrated system
- Fact-based decision making

1.g) Explain the main objectives of financial management. 2MARKS

- Maximize profit
- Ensure proper utilization of funds
- Maintain liquidity
- Financial planning and control
- Wealth maximization of shareholders

1.h) Discuss the advantages of NPV method. 2MARKS

- Considers time value of money
- Helps in better investment decisions
- Considers all cash flows
- Easy to compare projects
- Focuses on profitability

1.i) Explain the objectives of HRM 2MARKS

- Effective utilization of human resources
- Employee satisfaction
- Training and development
- Maintain good relations
- Improve productivity

1.j) Describe Supply Chain Management . 2MARKS

Supply Chain Management involves managing the flow of goods, services, information, and finances from raw materials to final customer.

It includes procurement, production, storage, and distribution to ensure efficient delivery at minimum cost.

PART B

UNIT – I

2.a) Discuss the role and responsibilities of an Industrial Engineer in an organization.

Role of an Industrial Engineer in an organization. 2.5 MARKS

Responsibilities of an Industrial Engineer in an organization 2.5 MARKS

An Industrial Engineer (IE) focuses on improving productivity, efficiency, and quality in an organization.

Role:Acts as a link between management and workers

Improves systems and processes

Ensures optimum utilization of resources

Responsibilities:Method Study:Analyze existing processes and develop better methods to reduce time and cost.

Work Measurement:Set standard time for tasks using techniques like time study.

Production Planning:Plan production schedules to meet demand efficiently.

Quality Control:Ensure products meet quality standards using SQC techniques.

Cost Reduction:Identify waste and eliminate unnecessary operations.

Layout Design:Design efficient plant layout for smooth workflow.

Safety Management:Ensure safe working conditions.

2.b) Explain advantages and disadvantages of plant layout.

Advantages: **2.5 MARKS**

- Smooth flow of materials
- Reduced handling cost
- Better utilization of space
- Increased productivity
- Improved supervision and control

Disadvantages : **2.5 MARKS**

- High initial cost
- Difficult to modify later
- Poor layout leads to delays
- May cause congestion
- Requires expert planning

OR

3.a) Explain the functions of Management with suitable examples.

functions of Management with suitable examples. 5 MARKS

Management is the process of planning, organizing, staffing, directing, and controlling the activities of an organization to achieve its goals efficiently and effectively.

1. **Planning** :Planning involves deciding in advance what to do, how to do it, when to do it, and who will do it.It sets objectives and determines the course of action. Helps in reducing uncertainty and risk.

Example:A manufacturing company plans to produce 10,000 units in a month based on market demand.

2. **Organizing**;Organizing is the process of arranging resources (men, materials, machines) and assigning tasks to achieve objectives.Divides work into departments.Establishes authority and responsibility

Example:Assigning separate teams for production, quality control, and marketing in a factory.

3. **Staffing**;Staffing involves recruiting, selecting, training, and developing employees.

Ensures the right person is in the right job.Improves employee performance

Example:Hiring skilled machine operators and providing training for new technology.

4. **Directing** (Leading)Directing means guiding, supervising, and motivating employees to perform their tasks.Includes leadership, communication, and motivation.Ensures employees work towards organizational goals

Example:A supervisor motivating workers to meet daily production targets.

5. **Controlling**:Controlling is the process of measuring performance, comparing it with standards, and taking corrective actions.Ensures work is done as planned.Helps in achieving goals effectively

Example:Checking whether production meets quality standards and correcting defects if found.

3.b) Discuss applications of different types of plant layouts.

Applications of different types of plant layouts. 5 MARKS

Plant layout refers to the physical arrangement of machines, equipment, and work areas in a manufacturing unit. Different types of layouts are used based on production type, volume, and product nature.

1. **Product Layout** (Line Layout) Machines and workstations are arranged in the sequence of operations.

Applications:

Automobile manufacturing industries

Assembly lines

Bottling plants

Cement and steel industries

2. **Process Layout** (Functional Layout) Machines performing similar functions are grouped together.

Applications:

Job shops

Workshops and repair centers

Printing presses

3. **Fixed Position Layout** The product remains at one place, and workers, materials, and machines move to it.

Applications:

Shipbuilding

Aircraft manufacturing

Construction projects

Heavy machinery production

4. **Cellular Layout** (Group Technology Layout) Machines are grouped into cells to manufacture similar parts.

Applications:

Flexible manufacturing systems (FMS)

Batch production industries

CNC machining units

Electronics manufacturing

5. **Combination Layout**A mix of two or more layouts (product + process).

Applications:

Large industries with varied production

Automobile plants (assembly line + process departments)

Textile industries

UNIT – II

4.a) Describe the steps involved in conducting method study. 5 MARKS

Method study is a systematic technique used to improve work methods and increase efficiency by eliminating unnecessary operations.

Steps in Method Study

1. **Select the Job**

Choose the work/process to be studied.

Priority is given to jobs with high cost, delays, or inefficiency.

2. **Record the Present Method**

Collect all relevant information about the current method.

Use charts like flow process charts, diagrams, and observations.

3. **Examine the Method Critically**

Analyze each step using

Checking if a movement or operation is unnecessary.

4. **Develop an Improved Method**

Eliminate, combine, rearrange, or simplify operations.

Aim to reduce time, cost, and effort.

5. **Evaluate the New Method**

Compare the improved method with the old one.

Check feasibility, cost savings, and efficiency.

6. Define the New Method

Clearly document the improved method.

Prepare standard procedures and instructions.

7. **Install (Implement) the Method**

Train workers and implement the new method.

Ensure smooth adoption.

8. Maintain the Method

Regularly monitor and ensure the method is followed.

Make improvements if necessary.

4.b) Discuss the advantages and limitations of time study.

Time Study is a work measurement technique used to determine the standard time required to perform a task by observing and recording the time taken under normal working conditions.

Advantages of Time Study **2.5 MARKS**

1. **Standard Time Determination**
   Helps in fixing the standard time for completing a task, which is essential for planning and control.
2. **Improved Productivity**
   By analyzing work methods, unnecessary motions can be eliminated, leading to higher efficiency.
3. **Better Cost Control**
   Accurate time standards help in estimating labor costs and preparing budgets effectively.
4. **Basis for Incentive Schemes**
   Time study provides a fair basis for wage incentive plans like bonuses and piece-rate systems.
5. **Effective Scheduling and Planning**
   Helps in production planning, manpower allocation, and meeting delivery deadlines.
6. **Performance Evaluation**
   Assists in measuring worker performance against standard time.

Limitations of Time Study **2.5 MARKS**

1. **Time-Consuming Process**
   Conducting a proper time study requires significant time and effort.
2. **Worker Resistance**
   Employees may feel stressed or fear increased workload, leading to opposition.
3. **Not Suitable for All Jobs**
   Difficult to apply in non-repetitive, creative, or highly variable tasks.
4. **Observer Bias and Errors**
   Human errors in observation and recording may affect accuracy.
5. **Requires Skilled Analyst**
   Proper execution needs trained and experienced personnel.
6. **May Ignore Human Factors**
   Factors like fatigue, motivation, and job satisfaction are not always considered.

OR

5.a) Discuss applications and advantages of work study in an organization.

Work Study is a systematic technique that combines **method study** and **work measurement** to improve efficiency, productivity, and utilization of resources in an organization.

Applications of Work Study in an Organization **2.5 MARKS**

1. **Improvement of Work Methods**
   Analyzes existing processes and develops better, simpler, and more efficient ways of doing work.
2. **Production Planning and Control**
   Helps in setting realistic production targets and scheduling activities effectively.
3. **Standardization of Operations**
   Establishes standard procedures and time for each task, ensuring uniformity in work.
4. **Manpower Planning**
   Determines the number of workers required and allocates tasks efficiently.
5. **Cost Reduction**
   Identifies wasteful activities and reduces unnecessary costs in operations.
6. **Plant Layout Optimization**
   Improves arrangement of machines and workflow to reduce movement and delays.
7. **Quality Improvement**
   By refining processes, it helps in maintaining consistency and reducing defects.
8. **Performance Measurement**
   Provides a basis to evaluate worker efficiency and productivity.
9. **Training and Skill Development**
   Helps in designing training programs based on standard methods.

Advantages of Work Study **2.5 MARKS**

1. **Increased Productivity**
   Eliminates unnecessary motions and improves work efficiency.
2. **Better Utilization of Resources**
   Ensures optimum use of men, machines, and materials.
3. **Reduced Production Cost**
   Minimizes waste, idle time, and delays.
4. **Improved Working Conditions**
   Simplifies tasks and reduces worker fatigue.
5. **Enhanced Employee Morale**
   Clear standards and fair performance evaluation improve job satisfaction.
6. **Accurate Time Standards**
   Helps in setting realistic deadlines and delivery schedules.
7. **Supports Incentive Schemes**
   Provides a fair basis for wage plans and bonuses.
8. **Better Management Control**
   Enables monitoring and controlling of operations effectively.

5.b) Define time study and explain its objectives.

Time Study is a work measurement technique used to determine the **standard time** required by a qualified worker to complete a specific task under normal working conditions, using a defined method and pace.

2 MARKS

Objectives of Time Study **3 MARKS**

1. **To Determine Standard Time**
   Establishes the normal time required to perform a task, which is essential for planning and control.
2. **To Improve Efficiency**
   Identifies delays and unnecessary activities, helping to streamline work processes.
3. **To Assist in Production Planning**
   Provides reliable data for scheduling, routing, and setting production targets.
4. **To Fix Fair Wages and Incentives**
   Forms the basis for wage plans such as piece-rate systems and bonus schemes.

5. **To Compare Alternative Methods**
   Helps in selecting the best method by comparing time taken for different approaches.
6. **To Reduce Costs**
   By improving efficiency and reducing idle time, overall production costs are minimized.
7. **To Evaluate Worker Performance**
   Enables comparison between actual performance and standard performance.
8. **To Aid in Manpower Planning**
   Helps determine the number of workers required for a given job.

UNIT – III

6.a) Define SQC and explain its importance in industry.

Statistical Quality Control (SQC) is the application of statistical techniques and tools to monitor, control, and improve the quality of products and processes in an organization. It involves collecting and analyzing data to detect variations and ensure that the process operates within acceptable limits. 2 MARKS

Importance of SQC in Industry 3 MARKS

1. **Maintains Consistent Quality**
   Helps ensure that products meet required quality standards by controlling process variations.
2. **Early Detection of Defects**
   Identifies problems in the production process at an early stage, preventing large-scale defects.
3. **Reduces Production Costs**
   Minimizes waste, rework, and scrap, leading to cost savings.
4. **Improves Productivity**
   Stable processes reduce interruptions and increase overall efficiency.
5. **Better Decision Making**
   Provides data-based insights, enabling managers to take informed decisions.
6. **Customer Satisfaction**
   Consistent quality leads to improved customer trust and loyalty.
7. **Process Control and Improvement**
   Tools like control charts help in monitoring process performance and continuous improvement.
8. **Standardization of Processes**
   Ensures uniformity in production and reduces variability.
9. **Supports Quality Certification**
   Helps organizations meet standards like ISO by maintaining documented quality control systems.

6.b) Explain the zero defect concept and its importance. **2.5 MARKS**

The Zero Defect Concept is a quality management philosophy that aims at producing products with no defects at all. It emphasizes "doing the job right the first time" rather than detecting and correcting errors later.
This concept was popularized by Philip B. Crosby, who believed that quality should be measured by the absence of defects, not by acceptable levels of errors.

Instead of allowing a certain percentage of defects, the zero defect approach focuses on prevention of mistakes through proper planning, training, and process control.

- Do it right the first time
- Prevention over inspection
- Quality is everyone's responsibility
- Continuous improvement

Importance of Zero Defect Concept **2.5 MARKS**

1. **Improves Product Quality**
   Ensures that products meet specifications without errors, leading to high reliability.
2. **Reduces Cost of Rework and Scrap**
   Eliminates expenses caused by correcting defects after production.
3. **Enhances Customer Satisfaction**
   Defect-free products build customer trust and loyalty.
4. **Increases Productivity**
   Less time is wasted on rework, leading to smoother operations.
5. **Builds Strong Organizational Culture**
   Encourages employees to take responsibility for quality in their work.
6. **Supports Continuous Improvement**
   Promotes constant efforts to eliminate errors and improve processes.
7. **Competitive Advantage**
   High-quality, defect-free products help organizations stand out in the market.

OR

7(a) **Explain the construction and application of $\bar{X}$ and R control charts.**

$\bar{X}$ (Mean) and R (Range) control charts are statistical tools used in Statistical Quality Control (SQC) to monitor the stability and variability of a process over time.

- $\bar{X}$ Chart → Monitors the process average (mean)
- R Chart → Monitors the process variation (range)

Construction of $\bar{X}$ and R Control Charts **2.5 MARKS**

1. Data Collection

2. Calculate Sample Statistics

3. Compute Overall Averages

4. Determine Control Limits

5. Plot the Charts

6. Interpretation

Applications of $\bar{X}$ and R Control Charts **2.5 MARKS**

1. Process Monitoring Used to track whether a manufacturing process is stable over time.
2. Quality Control in Production Widely used in industries like manufacturing, machining, and assembly lines.
3. Detection of Variations Identifies assignable causes such as machine faults, operator errors, or material defects.
4. Process Improvement Helps in taking corrective actions to improve quality and reduce variability.
5. Maintaining Consistency Ensures uniform product quality by controlling mean and variation.
6. Decision-Making Tool Assists managers in deciding whether to continue, stop, or adjust the process.

7(b) **Discuss applications of TQM in manufacturing and service industries.**

Applications of TQM in Manufacturing Industries **2.5 MARKS**

1. Quality Control in Production Ensures products meet specifications through process control techniques and inspection methods.
2. Process Improvement Identifies inefficiencies in production processes and eliminates waste to improve productivity.
3. Supplier Quality Management Maintains strong relationships with suppliers to ensure high-quality raw materials.
4. Reduction of Defects and Rework Implements preventive measures to minimize errors and reduce scrap.
5. Standardization of Operations Establishes standard procedures to maintain consistency in production.
6. Use of Statistical Tools Applies tools like control charts, Pareto analysis, and cause–effect diagrams for quality analysis.
7. Employee Involvement Encourages participation of workers in quality circles and improvement activities.

Applications of TQM in Service Industries **2.5 MARKS**

1. Improving Customer Satisfaction Focuses on meeting customer expectations through better service quality.
2. Service Process Optimization Streamlines service delivery processes to reduce waiting time and errors.
3. Consistency in Service Delivery Ensures uniform service standards across different locations and employees.
4. Employee Training and Development Enhances skills and behavior of staff to improve service quality.
5. Feedback and Complaint Handling Uses customer feedback to identify issues and improve services.
6. Error Reduction in Services Minimizes mistakes in transactions, billing, and communication.
7. Continuous Improvement Regularly updates service methods to enhance efficiency and effectiveness.

UNIT – IV

8(a)Discuss the importance of working capital budget. **5 MARKS**

1. Ensures Liquidity Helps maintain sufficient cash to meet short-term liabilities like salaries, rent, and supplier payments.
2. Efficient Fund Management Assists in proper allocation and utilization of current assets such as cash, inventory, and receivables.
3. Avoids Cash Shortages and Surpluses Prevents situations of excess idle funds or insufficient cash for operations.
4. Supports Smooth Operations Ensures uninterrupted production and business activities by maintaining adequate working capital.
5. Better Financial Planning Provides a clear estimate of financial needs, aiding in planning borrowing or investments.
6. Improves Profitability Efficient management of working capital reduces unnecessary costs and increases returns.
7. Facilitates Credit Management Helps in controlling receivables and payables effectively.
8. Decision-Making Tool Assists management in making informed decisions regarding inventory levels, credit policies, and expenses.
9. Enhances Financial Control Enables monitoring and controlling of current assets and liabilities.

8(b)Describe the various investment evaluation techniques.

Investment Evaluation Techniques **ANY TWO EACH 2.5 MARKS**

Investment evaluation techniques are used to assess the feasibility and profitability of capital investment projects. These techniques help managers select the best alternative based on returns, risks, and time value of money.

1. Payback Period (PBP)

- Measures the time required to recover the initial investment.
- Decision Rule: Shorter payback period is preferred.
- Limitation: Ignores time value of money and cash flows after payback.

2. Net Present Value (NPV)

- Calculates the difference between present value of cash inflows and outflows.

$$NPV = \frac{C_t}{(1+r)^t} - C_0$$

- Decision Rule: Accept if NPV > 0.
- Advantage: Considers time value of money and all cash flows.

3. Internal Rate of Return (IRR)

- The discount rate at which NPV becomes zero.

$$0 = \frac{C_t}{(1+IRR)^t} - C_0$$

Decision Rule: Accept if IRR > required rate of return.

- Limitation: May give multiple values in complex cases.

4. Profitability Index (PI)

- Ratio of present value of inflows to initial investment.

$$PI = \frac{\text{Present Value of Cash Inflows}}{\text{Initial Investment}}$$

- Decision Rule: Accept if PI > 1.
- Useful for ranking projects.

5. Accounting Rate of Return (ARR)

- Measures return based on accounting profit.

$$ARR = \frac{\text{Average Annual Profit}}{\text{Initial Investment}} \times 100$$

- Decision Rule: Higher ARR is preferred.
- Limitation: Ignores time value of money.

6. Discounted Payback Period

- Similar to payback period but considers time value of money.
- Decision Rule: Shorter period is preferred.

OR

9(a)Explain the estimation of working capital requirements. **5 MARKS**

Working capital requirement refers to the amount of funds needed to finance the day-to-day operations of a business. Estimation ensures that the firm has adequate liquidity without maintaining excess idle funds.

Steps in Estimating Working Capital

Determine Operating Cycle
Estimate Current Assets
Estimate Current Liabilities
Calculate Net Working Capital

Consider Safety Margin

Methods of Estimation

1. Operating Cycle Method Based on duration of operating cycle and cost of operations.
2. Percentage of Sales Method Working capital is estimated as a percentage of expected sales.
3. Cash Budget Method Estimates cash inflows and outflows to determine requirements.

9(b)Define capital budgeting and explain its importance.

Capital budgeting is the process of planning and evaluating long-term investments or expenditures of a firm. It involves deciding whether funds should be invested in projects such as purchasing machinery, expansion, replacement of assets, or new product development, based on their expected returns and risks. **2.5 MARKS**

Importance of Capital Budgeting: **2.5 MARKS**

1. **Long-term Decision Making:**It helps in making decisions that affect the company's future growth and profitability over a long period.
2. **Efficient Utilization of Resources:**Ensures that limited financial resources are allocated to the most profitable and viable projects.
3. **Maximization of Shareholder Wealth:**By selecting projects with higher returns, it contributes to increasing the value of the firm.
4. **Risk Assessment:**Evaluates the risk involved in different investment options and helps in choosing safer alternatives.
5. **Strategic Planning:**Aligns investment decisions with the overall objectives and strategies of the organization.
6. **Control over Capital Expenditure:**Provides a framework for monitoring and controlling large investments.

7. **Improved Profitability:**Proper selection of projects leads to better returns and enhances overall profitability.

UNIT – V

10(a)Define job evaluation and explain its importance.

Job evaluation is a systematic process of determining the relative worth or value of different jobs within an organization. It assesses jobs based on factors such as skills required, responsibilities, effort, and working conditions, to establish a fair and consistent wage structure. **2.5 MARKS**

Importance of Job Evaluation: **2.5 MARKS**

1. **Ensures Fair Wages:**Helps in determining equitable pay for different jobs based on their value, reducing wage inequalities.
2. **Eliminates Pay Discrimination:**Promotes equal pay for equal work, minimizing bias and favoritism.
3. **Improves Employee Satisfaction:**Fair compensation increases morale, motivation, and job satisfaction.
4. **Aids in Wage Structure Formation:**Provides a logical basis for developing a systematic salary structure.
5. **Supports Recruitment and Retention:**Competitive and fair pay helps attract and retain qualified employees.
6. **Reduces Labor Disputes:**Transparent evaluation reduces conflicts between management and workers regarding wages.
7. **Facilitates Performance Management:**Helps in linking job roles with performance standards and expectations.

10(b)Explain the concept and objectives of Value Engineering.

Value Engineering (VE) is a systematic and organized approach used to improve the value of a product, service, or process by analyzing its functions. It aims to achieve the required function at the lowest possible cost without compromising quality, performance, reliability, or safety. The focus is on eliminating unnecessary costs while maintaining or enhancing the product's utility. **2.5 MARKS**

Value is generally expressed as:Value = Function / Cost
Objectives of Value Engineering: **2.5 MARKS**

1. **Cost Reduction:**To minimize unnecessary costs in production, design, or operations without affecting quality.
2. **Improvement in Functionality:**To enhance the performance and efficiency of a product or process.
3. **Better Resource Utilization:**Ensures optimal use of materials, labor, and other resources.
4. **Encouraging Innovation:**Promotes creative thinking and development of alternative solutions.
5. **Quality Enhancement:**Maintains or improves the quality and reliability of products.
6. **Simplification of Design:**Eliminates complex and non-essential features to make products simpler and more efficient.
7. **Customer Satisfaction:**Delivers better value to customers by balancing cost and performance.
8. **Competitive Advantage:**Helps organizations offer cost-effective and high-quality products, improving market position.

OR

11(a)Describe quantitative methods of merit rating.

Quantitative Methods of Merit Rating: **ANY TWO EACH 2.5 MARKS**

Quantitative methods of merit rating evaluate employee performance using numerical values or measurable data. These methods provide objective, consistent, and comparable results by assigning scores or ratings to different performance factors.

Main Methods:

1. **Point Rating Method:**Each job factor (such as skill, effort, responsibility, and working conditions) is assigned a specific number of points. Employees are rated on these factors, and the total score determines their merit level.
2. **Factor Comparison Method:**Key job factors are identified and assigned monetary values. Jobs are compared factor by factor, and wages are determined based on the sum of these values.
3. **Weighted Point Method:**Different performance factors are given weights according to their importance. Employees are evaluated on each factor, and weighted scores are calculated to determine overall performance.
4. **Ranking Method (Quantified):**Employees are ranked based on performance, and numerical ranks or scores are assigned to indicate their relative standing.
5. **Graphic Rating Scale Method:**Performance traits (such as quality of work, punctuality, and cooperation) are rated on a numerical scale (e.g., 1 to 5). The total score represents the employee's merit.
6. **Checklist Method (Weighted Checklist):**A list of statements describing employee behavior is prepared, each with assigned weights. The evaluator selects applicable statements, and the total score is calculated.
7. **Performance Index Method:**A composite index is developed using measurable indicators like output, efficiency, attendance, and quality. The index provides a numerical measure of performance.

11(b)Discuss the applications of value engineering in industry. ANY 5 EACH 1 MARK

1. **Product Design and Development:**VE is used to simplify product designs, select cost-effective materials, and eliminate unnecessary features while maintaining functionality and quality.
2. **Manufacturing Processes:**Helps in improving production methods, reducing waste, minimizing cycle time, and increasing efficiency through process optimization.
3. **Cost Reduction Programs:**Identifies and removes non-essential costs in production, procurement, and operations without affecting performance.
4. **Material Substitution:**Suggests alternative materials that are less expensive but provide the same or better performance and durability.
5. **Standardization and Simplification:**Promotes the use of standard components and reduces product variety, leading to easier production and inventory control.
6. **Supply Chain Management:**Improves procurement strategies, vendor selection, and logistics to reduce overall costs and improve efficiency.
7. **Construction and Infrastructure Projects:**Applied in project planning and design to achieve required functions at minimum cost, ensuring efficient use of resources.
8. **Maintenance and Operations:**Identifies cost-saving opportunities in maintenance activities by improving methods and reducing downtime.
9. **Quality Improvement:**Enhances product reliability and performance while controlling costs through better design and process choices.
10. **Service Industries:**Used to streamline processes, reduce service delivery costs, and improve customer satisfaction in sectors like banking, healthcare, and IT.