INDUSTRIAL MANAGEMENT

&

SAFETY

REPEATED QUESTION - ANSWERS

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Lr IN AUTOMOBILE ENGG

GPC VENNIKULAM

INDUSTRIAL MANAGEMENT & SAFETY

Easy to get through series

Dear Students,

We, the ***Dept. Of Automobile Engineering, GPC Vennikulam***, proudly presents a learning material: ***Repeated question-answers for Industrial Management & safety*** in a very simple schematic order. It is prepared by ***V.Ramachandran***, the most experienced lecturer in polytechnic stream.

'How to answer questions effectively' is the most important factor in securing very good grades through effective time management. Through this humble endeavour, we would like to impart enough confidence to you, the student community.

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NB: THIS IS NOT A CAPSULE NOTE

INDUSTRIAL MANAGEMENT &SAFETY

MODULE-1

1) Write down the functions of human resource management?

i. Procurement of personnel

ii. Development of personnel

iii. performance appraisal

iv. Feedback and performance coaching

v. Compensation of personnel

vi. Employee's benefit schemes

vii. Maintaining good industrial relations

viii. Record keeping

ix. Personnel planning

x. Quality of work life

2) List the contributions of F.W.Taylor towards scientific management?

i. Developed principle of breaking a task(job) into elements for timing the same.

ii. Conducted exploration on causes of inefficiency and labor difficulties in industry.

iii. Evolved certain principles of investigating work on scientific basis, selecting best worker for the task, training him to acquire desired skill, developing cooperative spirit between management and workers, almost equal division of work between workers and management.

iv. Concept of a 'fair day's task' (need for planning work).Also undertook studies on fatigue incurred by workers and the time necessary to complete a task.

v. Taylor developed functional organization in which one foreman was made in charge for each function.

vi. Devoted maximum attention towards time studies and establishing work standards.

vii. Introduced and operated various costing systems.

viii. Suggested a wage incentive scheme known as Taylor's Differential Piece rate system.

3) Classify the co-operative societies?

Producer's co-operative society

Consumer's co-operative society

Housing co-operative society

Credit co-operative society

Multipurpose co-operative society.

4) Write principles of co-operative societies?

i. Voluntary association
ii. Democratic management
iii. Not profit motive
iv. Self help and mutual help
v. Open door policy
vi. Distribution of surplus

5) What is meant by staffing?

Staffing is the process of selecting, training, promoting and retiring the workforce.

Staffing involves the developing and placing of qualified people in the various jobs in the organization.

6) What is merit rating?

Merit rating measures the extent to which an employee meets job requirements. It measures the loyalty, integrity, intelligence, leadership qualities, dependability, character etc. of an employee.

7) What do you understand by job analysis?

Job analysis involves developing a detailed description of the tasks involved in a job , determining the relationship of a given job to other jobs and ascertaining the knowledge, skills and abilities necessary for an employee to successfully perform the job. The information provided by the job analysis would be useful for the subsequent process of recruitment, selection and placement.

8) Write two semi-financial incentives?

i) Subsidized educational facilities for children.

ii) Provision of subsidized lunch.

9) What is scientific management?

Scientific management refers to application of scientific methods to management practices, ie, use of scientific methods in decision making process for solving management problems rather than depending on rule of thumb or trial and error methods.

10) What is the meaning of company?

A company is an artificial person having an independent legal entity and a perpetual succession with a distinctive name and common seal. It is having a common capital divided into shares of fixed values which are transferable and carry limited liability.

11) Compare between contribution of F.W.Taylor and Fayol?

Similarity

i. Universality of management
ii. Scientific methods
iii. Importance of personnel
iv. Improvement of practice
v. Idea through experience
vi. Books written

Dissimilarity

i. Taylor for shop floor management, Fayol for top level management
ii. Taylor for bottom to upwards, Fayol from top to bottom
iii. Taylor for productivity, Fayol for theoretical approach
iv. Taylor for management, Fayol for administration

12) List the process of job evaluation?

i. Gaining assistance

ii. Greeting job evaluation committee

iii. Finding the job to be evaluated

iv. Analyzing and preparing job description

v. Selecting methods of evaluation

vi. Classifying jobs

vii. Installing the program

viii. Reviewing periodically

13) The standard time for a particular job is 8 hours and time taken by the worker to complete the job is 6 hours. If the operator is paid at the rate of Rs.10/- per hour, calculate the earnings of the worker under both types of Halsey plan and Rowan plan?

a)Halsey 50-50 plan

Earnings=RT+(S-T)R/2=6X10+(8-6)10/2=60+10=Rs.70/- per job

b) Halsey 33 1/3% plan,

Earnings=RT+(S-T)R/3=60+2X10/3=Rs.66.66/-job

c) Rowan plan

Earnings=RT+(S-T)/S RT=6X10+(8-6)/8 X10X6 =60+15=Rs.75/- per job

14) Explain the ranking system used in job evaluation?

In this system, a committee of persons who are familiar with the jobs and job description carries out the ranking. They studies all the jobs and job descriptions in the organization, and they are arranged or ranked in ascending order beginning with the one of minimum requirements and ending up with one of maximum requirement. While ranking, the following factors are considered.

i. Amount of work

ii. Supervision needed

iii. Responsibility required

iv. Difficulty in work

v. Monotony of work

vi. Working conditions

vii. Knowledge and experience needed

Ranking system is suitable for smaller organizations where the rates are thorough with all existing jobs in the enterprise.

15) List the steps in scientific approach of decision making?

i. Problem for analysis is defined and the conditions for observation determined

ii. Observations are made under different conditions to determine the behavior of the system containing the problem.

iii. Based on the observations, a hypothesis that describes how the factors involved are thought to interact or what is the best solution to the problem conceived

iv. To test the hypothesis an experiment is designed

v. The experiment is executed and measurements are obtained and recorded.

vi. Results of the experiment are analyzed and the hypothesis is either accepted or rejected.

16) Write differences between private limited company and public limited company?

Pvt. Ltd company	**public ltd. Company**
a)Min no. of prsons-2	mini. No. of persons-7
b)Max. No. of persons-50	max. No. of persons-unlimited.
c) Shares issued to promoters, their relatives and friends	Shares issued to public
d) Share transfer restricted among share holders	Shares can be transferred to any one
e)min. No. of board directors-2	min. No. of board directors-3
f) business secrecy possible	Secrecy of business not possible
g) Certificate of commencement. from registrar not reqd.	Needed
h) Need not circulate balance sheet,	Has to send financial statements to

profit and loss account among members members/registrar

17) Sketch the chart to show line and staff organization?

Secretary- - - - - -Board of director- - - - -legal adviser

Accounts officer- ----- General Manager---------sales manager

Design engineer---- Works manager----------stores officer

Superintendent ------- staff function

Foreman _____ line function

Workers

18) List the steps involved in selecting an employee for a job?

i. After conducting job analysis, prepare job description and job specification

ii. Determine various sources of recruitment such as employment exchanges, newspaper advertisement, campus interview etc

iii. Preparation of application format

iv. Calling for a selection test after preliminary filtration. Selection tests may be performance test, aptitude test, intelligence test, interest test etc.

v. Conducting the selection test where considered necessary

vi. Performing preliminary interview after selection test. Interview may be informal or formal

vii. Conducting medical examination of the applicant where it is required

viii. Conducting final selection interview with candidates

ix. Selecting and appointing persons selected in final interview

19) Describe the method of formation of a cooperative society?

i. An application submitted to registrar of co-operative societies of state

ii. There must be at least 10 members who are competent to contract

iii. Application should state clearly name, place, objective, capital structure, sources fund for the society etc.

iv. Bye laws to be drafted for the society

v. These bye laws are the rules and regulations in accordance with which society will function

vi. Along with application,2 copies of bye-laws and prescribed registration fees are submitted to the registrar

vii. If registrar is satisfied ,he will issue a certificate of registration after which society will admit members, collect share capital and commence business

20) Give the classification of training methods?

Training methods-

1) On the job methods

-Job rotation

-Coaching

-Job instruction or training through step by step

-Committee assignments

2) Off the job methods

-Vestibule training

-Role playing

-Lecture methods

-Conference or discussion

-Programmed instruction

21) Explain partnership deed?

To avoid any complication at a later stage, the constitution of a partnership firm may be written in an agreement form. This agreement is known as partnership deed. It contains the following

i.Name of the firm

ii) Name of the business

iii) Date of starting business

IV)Money contributed by each partner

v) Allotment of management functions among partners

vi) Salary if any, allowed managing partners.

Rate of interest on capital if any

Basis of introduction of any new partner

22) Explain different kinds of partners?

i. Active partner Who take active part in the management of the business enterprises

ii. Sleeping partner. Who do not take any active part in the business process, but invests their money.

iii. Nominal partner. Who do not invest money and do not take part in the management, but they lend their reputed name for the company's product/service.

iv. Secret partner. Whose name does not appear anywhere, but they take part in the management secretly.

v. Minor partner. Who has not attained age of 18 years

vi. General partner. All the partners in the organization are known as general partners.

INDUSTRIAL MANAGEMENT AND SAFETY

MODULE – 2

1) List 10 mantras of TQM ?

i. Quality is never an accident. It is always the result of untiring and intelligent effort.
ii. Quality is like a prayer to GOD. Which never comes out without hard work and devotion?
iii. Quality is everybody's work.
iv. Take care of quality, quantity will take care of itself.
v. Document is dependable, but not the memory.
vi. Quality begins with clean lines of workplace.
vii. Quality is achieved through teamwork.
viii. Quality begins and ends with education.
ix. Quality is the attribute that a customer uses to evaluate products and services.
x. Make it right for first time an all times.

2) Define quality?

Quality is defined as "the totality of features and characteristics of a product or service that bear on its ability to satisfy stated or implied needs".

3) Name 2 agencies in India which issued ISO – 9000 certificates?

Indian Registrar Quality Systems (IRQS)

Bureau of Indian Standards (BIS)

4) What is the prong approaches to quality planning?

i. Product Planning
ii. Management and operational planning
iii. Documentation

5) State the Philosophy of TQM?

Total Quality Management (TQM) is the integration of all functions process and personnel within the organization in order to achieve the continuous improvement of the quality of services which allow for full customer satisfaction.

6) List any 6 objectives of quality planning?

i. To create an excellent culture
ii. Produce quality product
iii. To prepare guide lines of various elements of quality
iv. Identify opportunities for excellence
v. Development of quality control technique
vi. Analysis of quality costs
vii. To build up a basis for total quality management culture
viii. Conducting process capability studies.
ix. Defining quality standards and preparing product specifications.
x. Analysis of customers quality requirements and formulation of design specifications.
xi. To build up a committed work force.
xii. Evaluation suppliers capabilities and putting standards for incoming materials.

7) Write short noted on ABC control policy?

ABC analysis is a basic analytical material management tool. It is a selective approach popularly known as A – always, B-better, C-Control. An item group of 10% of the total number of item and 70% of total money value of all items. B-items grouped constituted 20% of total number of items and 20% of total money value of all items. C-items group 70% of the total number of items and 10% of total money value.

8) List the benefits of an ISO – 9000 company?

ISO – 9000 helps to

i) Organization in promoting their products in international market

ii) Organizations in creating confidence to the customers regarding the product quality which improves profits.

iii) Organizations in withstanding competition from other producers of product in

iv) He global market

v) Suppliers in improving the quality of new materials, semi finished and finished products.

vi) Consumers in getting good quality products.

vii) The quality system improves the efficiency, reduces the wastages, inspections and also rework.

9) Annual requirement of an item for a production schedule is 12000 units. No safety stock is kept. Ordering cost is Rs. 9/- and carrying cost is Rs. 4 per unit per year. What is EOQ if the lead time is 5 days and the firm works 300 days in a year? Find the re-order level?

A= Annual consumption = 12000 units

S = Ordering cost per order = Rs. 9/-

R = carrying cost per unit per year = Rs. 4/-

.. EOQ = Q =

Solution

A=Annual consumption

=12000 units

S=ordering cost per order

=Rs.9/-

R=carrying cost per unit per year

=Rs.4/-

:ï EOQ=Q= $\sqrt{}$ 2AS/R = $\sqrt{}$ 2X12000X9/4 =232 units

Re – order level= safety stock +lead time consumption

Lead time consumption =daily consumption x lead time in days

= (12000/300) x5

=200 units

Safety stock = 0 (given)

Hence re-order level =0+200=200 units

10) A manufactures uses Rs. 10,000 worth of an item during the year. He has an estimated an ordering cost of Rs. 25/- per order and carrying cost as 12.5% of average inventory value. Find optimal order size, number of orders per year, time period per order?

A = Rs. 10,000/-

S = Rs. 25/-

R = 12.5% = .125

EOQ = Q =

Solution

A= Annual consumption

=Rs.10, 000

S= Ordering cost per order=Rs.25/-

R= carrying cost=12.5% =.125 Rs.

EOQ=Q= $\sqrt{}$ 2AS/R = $\sqrt{}$ 2X10, 000X25/0.125 = 2000 units

Number of orders per year =(A/Q) =10,000/2000 =5

Time period per order = Q/A = 2000/10 000 = 1/5 Year = 365x 1/5 =73 days

11) What is purchase? Write the objectives of purchasing?

Purchasing means procuring or buying of materials, Supplies, machinery, machine tools and services etc. needed for production and maintenance of a concern.

Objectives of purchasing

i. To procure right material
ii. To procure material of right quality
iii. To procure material in right quantity
iv. To procure from right and reliable source and vendor
v. To procure and deliver materials at right place at right time
vi. To procure material in right prices.

12) Write down the purchase procedure?

i. Purchase requisition
ii. Selection of possible sources of supply
iii. Determining the time, price, quality and quantity
iv. Making request for quotations
v. Receipt and analysis of quotations
vi. Selection of right sources of supply
vii. Placing the purchase order
viii. Following up and expediting of order
ix. Inspection
x. Checking and approving vendor's invoices for payment
xi. Closing completed orders

xii. Maintenance of records and files

13) Write functions of stores department? OR Explain duties and responsibilities of store keeper?

i. Identity all items of stock and plan the store for optimum utilization of cubic space (length, breadth, height)

ii. To receive all types of materials, goods and equipment including manufactured products in the factory and records them with their cost.

iii. Correct positioning of all materials and supplies in the stores.

iv. Maintain stocks safely and in good condition by taking all precautions to ensure that they do not suffer from damage, theft or deterioration.

v. Issue items to users only on the receipt of authorized stores requisition.

vi. Record and update the issue of materials.

vii. Check the bin card balances with physical quantities in the bins,

viii. Make sure that stores are kept clean and in good order.

ix. Prevent unauthorized persons from entering the stores.

x. Inform purchase department whenever the existing stock of any item is likely to be exhausted for its purchase.

xi. To co-ordinate and co-operate with purchasing, manufacturing, inspection and production planning and control department.

14) State the roles of Accreditation board?

1. It gives guidance of launching quality system certification in the following areas;

a) Quality system appreciation programme

b) Quality system survey

c) Trial assessment

d) Final assessment

e) Licensing

f) Conducts seminar, conferences, and workshops on ISO – 9001 standards.

2. Accreditation board gives following services

a) Quality management technology
b) Train and certify ISO – 9001 assessors
c) Raise level of quality consciousness in industry and government
d) Develop quality management and quality assurance system including writing manuals and procedures
e) Second party certification (Customer audit)
f) Undertakes consultancy assignments.

15) Write dimensions or requirements of quality?

i. Suitability
ii. Durability
iii. Dependability, reliability
iv. Safe workability
v. Affordability
vi. Applicability
vii. Value for money

16) Write functions of store keeping?

i. Receipt
ii. Storage
iii. Retrieval
iv. Issue
v. Records
vi. House keeping
vii. Control
viii. Surplus management
ix. Verification
x. Coordination and cooperation

17) Explain the elements of ISO – 9000?

ISO 8402 : It is the first series of the terminology standard.

ISO 9000 basic concept explanation of quality, quality policy, traceability etc. Also on selection and use of other standards like ISO9001, ISO9002, ISO9003 etc.

ISO 9001 Quality assurance model for design, development, production, installation and servicing.

ISO 9002 Quality assurance model for production, installation, and servicing.

ISO9003 Quality assurance model for final inspection and test/

ISO9004 Guidelines for establishing quality management system/

It contains guidelines on technical, administrative and human factors affecting the quality of products/services for internal use only.

ISO 900 latest t version is ISO 9000 – 2008

18) Write steps involved in ISO 9000 INSTALLATION?

A) Preparatory Step

i. Management commitment to ISO 9000. Conduct awareness programme for top management.

ii. Set up implementation committee and appoint a coordinator.

iii. start ISO 9000 awareness programme.

iv. find out current status and prepare an action plan

iv. develop an organizational structure

vi. develop quality system documentation

B) **Implementation step**

i. Implement the documented quality system

ii. establish internal quality audits

iii. monitor and stabilize the quality system

iv. conduct pre registration internal audit

C) **Registration and certification steps**

i. apply for registration

ii. adequacy audit by certification body

iii. Compliance audit by ertifiation body

iv. Certification

19) Define quality audit? Also list objectives of quality audit?

Quality audit is defined as a systematic and independent examination to determine whether the quality objectives are as per the plan and whether these plans are implemented effectively and are suitable to achieve company objectives.'

Objectives

i. To study the quality of the existing system and find out the non-conformity with quality system
ii. To suggest corrections to be done in different areas and operations
iii. To propose improved methods as per ISO standards
iv. To evaluate a supplier before entering a contract with him
v. To suggest best procedures and practices

20) List 4 corner stones of TQM?

i. Create satisfied customer
ii. top management commitment, leadership and involvement
iii. participation by all(total involvement)
iv. continuous incremental improvement

21) Explain different types of quality audits?

Adequacy audit management audit

Checks whether the documentation is as per the quality manual, associated procedures and work instructions. Also it checks adequacy of documentation as per ISO standard.

Compliance audit

Examine the extent to which documented system is implemented and obeyed by the people with the system.

System audit

Evaluates the quality aspects of various systems in the organization such as marketing, production, assembly ,inspection, design and development.

Product audit

Involves the acceptance level of the product made by inspection and testing department.

First party audit or internal audit

ISO 9000 demands regular internal quality audits (Self audit by an organization) in addition to third party or external audit. Purpose of internal audit is to provide a self- correcting mechanism within organization.

Second party audit or customer audit

In this audit the customer audits the supplier

Third party audit or external audit

Done by an external certifying agency or an independent organization on a supplier. Generally done by qualified national or international agency. After conducting satisfactory audit certifying agency will issue ISO certification.

22) Write short notes on location?

While locating the stores the size of the industries to which it is attached is taken into account and other factors considered are bulk of material that arrives to stores, amount of material to be handled during issues to various sections daily. Sore may be located as centralized store or decentralized store.

23) Write short notes on managerial and operational planning?

a) Preparing organizational structure - Involve responsibity - authority relationship arranged in a pattern.

b) Preparing organizational procedures which involve written documentation of purpose and scope of each and every activity.

c) Preparing process which involves set of inter related resources and activities which transforms input into output in the most effective and quality effective manner.

Preparation of resources needed to implement quality management. This includes the resources needed for all activities of overall management functions hat determine quality policy, objective and responsibilities.

24) Explain the buying techniques?

a) **Single tender:** the tender invite from one reliable supplier only. This system of purchasing is used under following conditions,

- For purchasing monopolistic items
- When qualities of extreme importance
- For purchasing C class items
- When items are required urgently

b) **Spot quotation.** This system of purchasing is used when purchases are to be carried out very urgently. The buyer goes to market and collects minimum of 3 quotations of items and purchase from the supplier quoting lowest rates.

c) **Open tender** also called press tender or advertised tender. It is published in news papers, journals, etc. for procuring materials of desired specifications. This system is used when local vendors are not available or rates quoted by them are high.

d) **Limited tender**: Representatives of various sales organizations often approach various organizations to register themselves as a vendor. In this system few reliable vendors are to send written letters the price and other details for particular commodity.

25) Explain briefly the different methods of purchasing?

a) **Rate contract purchasing**

Here contracts are given to suppliers for large amounts of future requirements, for a considerable time of about 2years.

b) **Central purchase organization**

Big companies are generally having section wise stores at different places. In this case it is possible to purchase materials by each store or main store may purchase all the material for different sections and go on supplying materials to section wise stores.

c) **Purchasing by requirement:** materials are purchased as and when they are required to a concern for production.

d) **Purchasing for a specific period**

Certain standard items are listed and purchased for a specific period of 1 or 2 months.

e) **Marking purchasing**

Requirements are calculated as per production planning .Purchasing is done after analyzing market trends.

f) **Speculative purchasing**

Purchasing in excess of foreseeable requirements in order to make profit from temporary price falls. Organization should have sufficient working capital to fund such purchase.

g) **Through Directorate general of supplies and disposals(DGS&D)**

This is a central purchasing organization to purchase materials for various government departments.

26) Define sales forecasting? Write importance of sales forecasting?

Sales forecasting is the estimation of type, quantity, and quality of future sales.

i. To determine production rate and volume production
ii. To determine financial requirements
iii. To know about the need for plant expansion
iv. To formulate pricing policies

v. To decide need for sales promotion activities

27) Write methods of sales forecasting?

i. historic estimate

ii. trend line techniques

iii. sales force estimate

iv. correlation techniques

vi. Sampling techniques

28) Write 3 factors considered while forecasting?

Trend, cyclic variation, seasonal variation

29) Write the factors governing the demand for a product?

a) competitor's strategy

b) future changes in production process

c) Customer tastes

d) arrival of new products from foreign countries

e) Government policies

f) country's economic situation

30) List the types of store records?

i. inward and outward registers

ii. stock registers(dead stock register and consumable register)

iii. daily receipt register

iv. issue register

vi. Store ledger

vii. Suspense register

viii. Condemned article register

ix. Loan register

x. Empty containers and package register

31) What are the methods of grouping of materials?

i. V.E.D. control policy-vital, essential, desirable

ii. H.M.L. control policy-high , medium ,low cost

iii. S.D.E. control policy-scarce, difficult , easily available

iv. F.S.N. control policy-fast, slow, non moving items

v. A.B.C. control policy- Always better control

32) What is meant by inventory?

Inventory means materials held in stock for later use. Inventories include raw materials, general stores, spare parts, manufactured parts, semi finished parts, tools and gauges, packaging materials, work in process, and finished products.

33) What is inventory control or stock level?

It is the scientific method of finding out a) how much stock to be maintained in order to meet production demands b) to provide right type of material at right time in right quantities and least cost.

34) What are the objectives of stock control?

or

What are the advantages of stock control?

i. to supply material to production department as and when required

ii. to avoid overstocking so that money invested in stock will be minimum.

iii. to avoid shortage as well as overstocking of materials

INDUSTRIAL MANAGEMENT & SAFETY

MODULE – III

1. Write short notes on a) Pre- operation b) Successor activity c) Dummy activity

a) Pre-operation is the operation which precedes the operation under consideration.

b) Post operations (successor activity) are the operation which follows after the operation under consideration is completed.

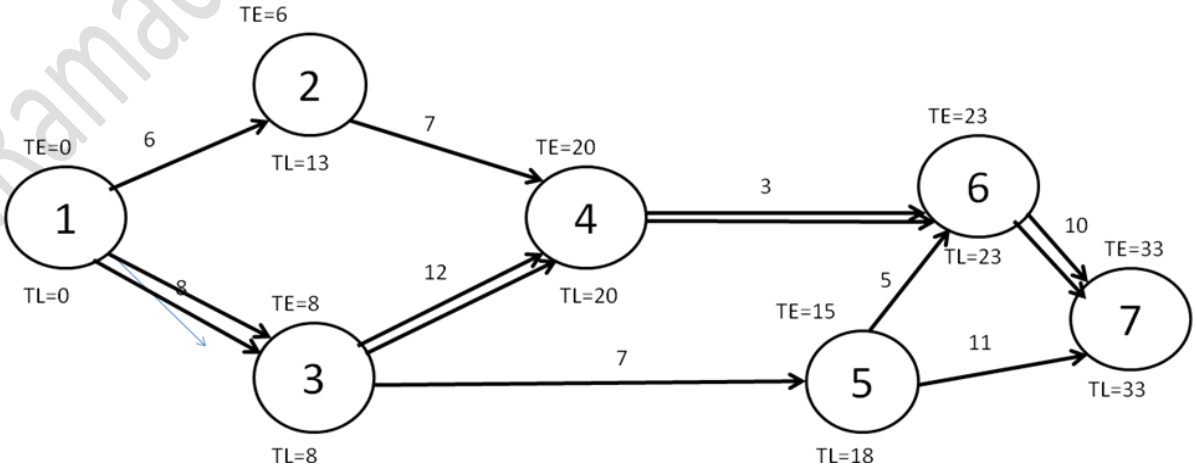
1. A project has 9 activities. The expected time of each activity is as shown below.

Activity	1-2	1-3	2-4	3-4	4-6	5-6	3-5	5-7	6-7
Expected time in weeks	6	8	7	12	3	5	7	11	10

i) Draw the project network

ii) Identify the critical path

iii) Find project duration



(Network diagram)

Project duration is 33 weeks

Critical path is 1-3-4-6-7

2. Define event and activity?

Event is the start or completion of a task represented by circle or node and do not consume time and resources.

Activity is the actual performance of a task which consumes time and resources such as manpower, time etc. It is represented by the line and arrow.

3. What is PERT: Which are the three time estimate for PERT:

PERT stands for **Programme Evaluation and Review Technique**. It is a network technique for planning, monitoring and controlling the projects.

3 Time estimate for PERT are

a) Optimistic time : It is the minimum time in which an activity can be completed under ideal conditions denoted by (to)

b) Pessimistic time (tp) is the maximum possible time in which an activity can be completed under worst conditions, assuming every possible delay and difficult situations.

c) Most likely time (tm) is the time in which an activity can be completed under normal conditions assuming that every things goes on in the normal way.

d) [Expected time (e) is the average time in which an activity can be completed as calculated from the formula]

$$te = \frac{to + 4tm + tp}{6}$$

4. Distinguish between CPM and PERT?

i)	Activity oriented system	Event oriented
ii)	Deterministic model with well known activity times based on past experience	Probabilistic model with uncertainty in activity duration
iii)	Expected time is actual time taken	Expected time is calculated from t_D, tm and tp
iv)	Uses terminologies like arrow diagram nodes, and float	Uses terminologies like network diagram, events and slack
v)	Use of dummy activity not necessary	Dummy activities required for representing proper sequencing
vi)	Marks critical activities	Does not demarcate between critical & non-critical activities
vii)	Suitable for plant maintenance, construction projects	Suitable for defense projects and R & D works

5. A project has 7 activities. Draw net work diagram. Three time estimates are given below.

Activity	Optimistic time (weeks)	Most likely time	Pessimistic time
1-2	1	1	7
1-3	1	4	7
1-4	2	2	8
1-5	1	1	1
3-5	2	5	14
4-6	2	5	8
5-6	3	6	15

i) Draw project network

ii) Calculate expected time

iii) Identify critical path

iv) Find project duration

i) Expected time (te) is calculated below

Activity **te = $\frac{to+4tm-tp}{6}$**

1-2 $\frac{1+4x1+7}{6} = 2$

1-3 $\frac{1+4x4+7}{6} = 4$

1-4 $\frac{2+4x2+8}{6} = 3$

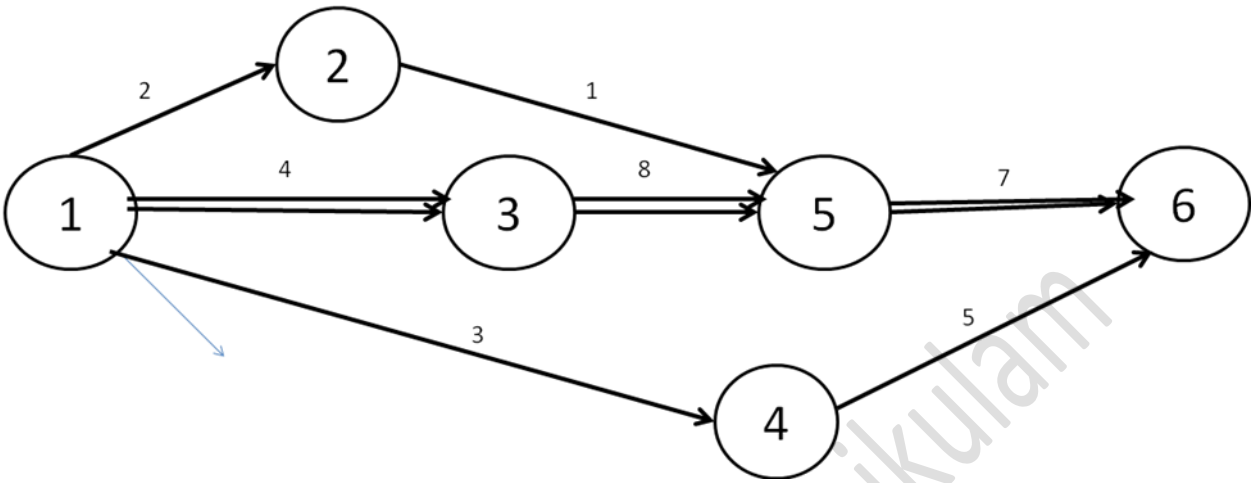
2-5 $\frac{1+4x1+1}{6} = 1$

3-5 $\frac{2+4x5+14}{6} = 6$

4-6 $\frac{2+4x5+8}{6} = 5$

5-6 $\frac{3+4x6+15}{6} = 7$

And network is shown



ii) Expected time for each activity is shown above

iii) Total duration for project for different paths are

Path	Total duration (days)
1-2-5-6	2+1+7 = 10
1-3-5-6	4+6+7 = 17
1-4-6	3+5 = 8

Critical path = 1-3-5-6

iv) Project duration = 17 weeks

6. Write Fulkerson's rule for numbering the events in networks constructions

1. There is a single initial event in the network diagram. It will have arrows corning out of it and none entering it. Number this initial event as 1.
2. Neglect all the arrows emerging out of initial event numbered one or more new initial events.
3. Number these apparently produced new initial events as 2,3,4 etc
4. Again neglect all emerging arrows from these numbered events. This will create few more initial events.
5. Follow step 3

6. Continue this operation until the last event, which has no emerging arrows, is numbered.

7. What is critical path ?

Path on the network along which no slippage is allowed. In this path slack is negative or zero

8. Write applications of CPM and PERT?

C.P.M

i) Construction of civil and mechanical projects

ii) Electrical and electronic product manufacturing and assembling

iii) Equipment maintenance, plant maintenance, over holding etc

iv) Setting up new industries

v) Shifting manufacturing location from one place to another.

PERT

1. Research and development activities
2. Military operations
3. Design and development of new product innovations
4. Weather fore casting

9. Write processor of operation research?

i) Observe the problem environment

ii) Analyze and define the problem

iii) Develop a model

iv) Select appropriate data input

v) Provide a solution and test reasonableness

vi) Implementation of solution

10. Write the different quantitative technique?

1. **Linear programming**
   a) Graphical method
   b) Transportation method
      i) Vogeli approximation methods (VAM)
      ii) North west garner method (wwc)
   c) Simplex method
2. Waiting line or Queuing theory
3. Game theory
4. Dynamic programming

11. Write application of queuing theory

i) In the field of bushier (banks, booking counters)
ii) Industries (servicing of machinery)
iii) Government (railway or post office counters)
iv) Transportation (Airport , Harbon)
v) Every day life (elevators, restaurant doctor's chamber)

12. What is saddle point

Saddle point is a position of such an element in the pay off matrix which is minimum in its row and maximum in its column. Pay off at the saddle point is the value of the game.

13. From the following game, find the saddle point and state the game value player B

$$Player\ A \begin{matrix} A1 \\ A2 \end{matrix} \begin{bmatrix} B1 & B2 \\ 4 & 2 \\ -1 & 4 \end{bmatrix}$$

Solution

	B_1	B_2	Row min
A_1	4	2	2
A_1	-1	4	-1
Column max	4	2	

Maxi min = Maximum of row minimum

= max (2, -1) = 2

Mini max = minimum 1, column max

= Min (4,2)

= 2

Max min = Min max = 2

So saddle point is (A_1, B_2) and value of game = 2

14. A furniture manufacture maker 2 products X_1 and X_2 namly chairs and tables. Each chair contributor a profit of Rs. 20 and each table that of Rs. 40/- chairs and tables from raw material to finished product, are processed in 3 sections S_1, S_2 and S_2 . In section S, each chair (x_1) repairer one hour and each table (x_2) repairer 4 hours of processing. In section S_2, each chair repairer 3 hours and each table 1 hour and section S_3 the times are 1 hour and 1 hour respectively. Manufacturer wants to optimize his profits if section S_1, S_2 and S_3 can be availed for not more than 24, 21 and 8 hour respectively.

Solution

Model is

Maximize $Z_{max} = 20x_1 + 40 \times 2$

Subject to $x_1 + 4x2 \leq 24\ (i)$ $2,x1 + 2 \leq 21\ (i)$

$$x_1, x_2 + 2 \geq 0$$

1, 2, 3 are construction

Converting inequalities into equations

$X_1 + 4x_2 = 24$ –(1)

$3 \times 1 + x_2 = 21$ (2)

$X_1 + x_2 = 8$ (3)

Taking 1st construct equation, $x_1 + 4x_2 = 24$

When $x_1 = 0$, $y_1 = 24/4 = 6$

Next substitute $x_2 = 0$, $x_1 = 24$

Mark point (0,6) and (24,0), join than

III by from $3x_1 + y_2 = 21$,

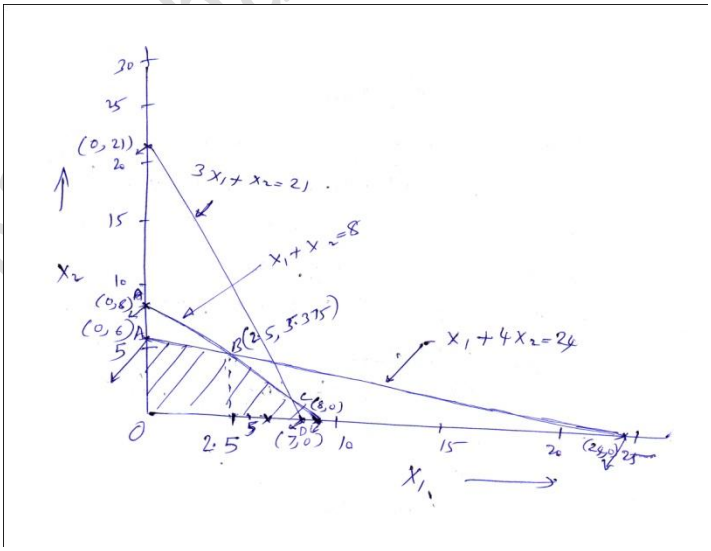
If $x_1 = 0$, $x_2 = 21$ (0,21)

Aled when $x_2 = 0$ $x_1 = 7$ (7,0)

IIIby from $x_1 + x_2 = 8$,

If $x_1 = 0$, $y_2 = 8$ (0,8)

$Y_2 = 0$, $x_1 = 8$ (8,0)



(Graphical method)

Area OAB CD is figure satisfied by the constraints is shown by shaded area and is known as feasible solution region

Corner point	Coordinate	$Z=20x_1 + 40x_2$
O	(0,0)	20x0+40x0 = 0
A	(0,6)	20x0+40x6 = 240
B	(2.5, 5.375)	20x2.5+40x5.375 = 265
C	(6.25, 1.5)	20x6.25+40x1.5 = 185
D	(7,0)	20x7+40x0 = 140

Max Z = 265

$X_1 = 2.5$ and $X_2 = 5.375$

15. Consider a manufactures who operator three factories and dispatcher his product to five different retail shops. Table below shown the capacities of 3 factories, the quantity if the products required at the various retails shops and the cost of shipping one unit of product from each of 3 factories to each of the five retails shops. Obtain an initial feasible solution to problem using North went corner method.

	Retails shops					
Factory	1	2	3	4	5	Capacity
9_1	1	9	13	36	51	50
9_2	24	12	16	20	1	100
9_3	14	33	1	23	26	150
Re	100	70	50	40	40	300
	b_1	b_2	b_3	b_4	b_5	

Solution

	1	2	3	4	5	Capacity
1	50	1	9	13	36	51
2	100	24	12	16	20	1
3	150	14	33	1	23	26
	100	70	50	40	40	

1st solution made in cell (1,1) Meg is min (100, 50) = 50

	1	2	3	4	5	Capacity
1		50 1	9	13	36	51 50
2	100	24	12	16	20	1
3	150	14	33	1	23	26
	100	70	50	40	40	300

Requirement
Shaded portion indicator row is deleted

	1	2	3	4	5	Capacity
2		50 24	12	16	20	1 100
3	150	14	33	1	23	26
	50	70	50	40	40	

Requirement

[In above table North went cell is (1,2) allocation is min (100,500) = 50 & delete 1st column]

	2	3	4	5	Capacity
2	50 12		16	20	1 50
3	150 33		1	23	26
	70	50	40	40	

Requirement

	2	3	4	5	Capacity
2	20 33		50 1	40 23	40 26 150
3					
	70	50			

Complete allocation in shown in table below.

	1	2	3	4	5	Capacity
1	50	50 1	9	13	36	51
2	100	50 24	50 12	16	20	1
3		14	33	50 1	40 23	40 26 150
	100	70	50	40	40	300

Requirement

[Basic feasible solution]

Corresponding transportation cost is

= 1 x 50 + 24 x 50 + 12 x 50 + 20 x 33

+ 50 x 1 + 40 x 23 + 40 + 26

= Rs. 4520/-

16. Find initial feasible solution for the transportation problem given in the table below by Vogel's method.

To / From	W_1	W_2	W_3	Supply
F_1	2	7	4	5
F_2	3	3	1	8
F_3	5	4	7	7
F_4	1	6	2	14
Demand	7	9	18	

Solution Allocate min of 5 & 7 = 5 cell (1 1) having lowest cost.

To / From	W_1	W_2	W_3	Supply	Difference
F_1	5 ~~2~~	~~7~~	~~4~~	~~5~~	4-2=2 ←
F_2	3	3	1	8	3-1=2
F_3	5	4	7	7	5-4=1
F_4	1	6	2	14	2-1=1
Demand	7	9	18	~~36~~ 36	

Difference 2 – 1 = 1 4 – 3 = 1 2 – 1 = 1

	W_1	W_2	W_3	Supply	Difference
~~F_2~~	~~3~~	~~3~~	8 ~~1~~	~~8~~	3-1=2 ←
F_3	5	4	7	7	5-4=1
F_4	1	6	2	14	2-1=1
Demand	2	9	18	29	

Difference 3 – 1 = 2 4 – 3 = 1 2 – 1 = 1

	W_1	W_2	W_3	Supply	Difference
F_3	5	4	7	7	1
F_4	1	6	10 2	14	1
Demand	2	9	10	21	
Difference	4	2	5		

	W_1	W_2	Supply	Difference
F_3	5	4	7	1
F_4	2 1	6	14	5 ←
Demand	2	9	21	
Difference	4	2		

	W_2	Supply	Difference
F_3	7 4	7	
F_4	2 6	2	←
Difference	9		

Feasible

To / From	W_1	W_2	W_3	Supply
F_1	[5] 2	7	4	5
F_2	3	3	[8] 1	8
F_3	5	[7] 4	7	7
F_4	[2] 1	[2] 6	[10] 2	14
Demand	7	9	18	34 / 34

Corresponding transportation cost

= 5 x 2 + 8 x 1 + 7 x 4 + 2 x 1 + 2 x 6 + 10 x 2

= 80/-

INDUSTRIAL MANAGEMENT & SAFETY

MODULE-4

1) Define accident proneness?

Accident proneness may be defined as the continuing tendency of a person to have more accidents as a result of his persisting characteristics.

2) List the mechanical factors causing accidents?

i. Improper machine guarding

ii. Unsafe mechanical design or construction.

iii. Defective devices

iv. Improper material handling

v. Hazardous arrangement (piling, overloading etc.)

vi. Unsafe apparel

vii. Broken safety guards

viii. Leaking acid valves

ix. Untested boilers or pressure vessels

x. Protruding nails.

3) List functions of safety officer in industry?

i. Safety officer is responsible for entire safety of industry and formulate policies, measures and action,

ii. He takes initiative to conduct periodic meeting of safety committee

iii. He should note safety statistics

iv. He should conduct safety seminar

v. He should consult with safety councils and government agencies

vi. Ensure 4 E's programmes(engineering methods, education, enterprising, and enforcement)

vii. Educate employees to develop safety consciousness

4) Write down effects of different pollutants on human beings?

i. LEAD -Bone trouble, lever, and kidney damage. Mental health affected in children and abnormalities, infertility and pregnancy problems.

ii. CARBON MONOXIDE -Inhibits oxygen intake. Hemoglobin in blood affected. Cause dangerous headache/nausea.

iii. NITROGEN COMPOUNDS- Severely irritating and excess illness

iv. PHOTOCHEMICAL OXIDANTS-Aggravation of asthma and high irritation.

v. OZONE-Irritation of nose, throat, head ache and dryness of mouth/throat

vi. PARTICULATES AND SULPHUR OXIDES-Severe respiratory diseases, chronic bronchitis and lung cancer

5) Define noise? Briefly explain methods of noise control?

Unpleasant and unwanted sound is called noise.

Methods of control

i. Isolating sound producing equipments

ii. Providing sound absorbing material

iii. Provide damping or cushioning devices for impacting and vibrating parts

iv. Plant trees around factories

v. Enclosures with inside lining for absorption of sound

vi. Provide some kind of ear plug for workers

vii. Provide soft furnishing carpets

6) Define an accident?

Accident may be defined as a disaster that results some sort of injury /damage to men, machine and tools during working in an industry.

7) List the causes of accident proneness? OR Explain various accident factors?

PERSONAL FACTORS

i. Age and health of employees
ii. Home environment
iii. Financial position
iv. Number of dependents
v. Lack of knowledge and skill
vi. Improper attitude towards work
vii. Carelessness and recklessness
viii. Improper usage of tools and equipments
ix. Incorrect machine habits
x. Day dreaming
xi. Fatigue
xii. Emotional instability
xiii. Mental worries
xiv. Unnecessary exposure to risk
xv. High anxiety level
xvi. Non use of safety devices
xvii. Working at unsafe speed

MECHANICAL FACTORS

i. Improper machine guarding
ii. Unsafe mechanical design or construction
iii. Defective devices
iv. Improper material handling

v. Broken safety guards

ENVIRONMENTAL FACTORS

i. Too low temperature to cause shivering

ii. Very high temperature for head ache and sweating

iii. Too high humidity for uncomfort, fatigue, drowsiness and asthmatic complaint etc

8) What are solid wastes? Write methods of solid waste management?

Solid wastes are unwanted or discarded waste materials from houses , hospitals, street sweeping, commercial, industrial and agricultural operations and others arising from man's activities

Methods of solid waste management

i. Dumping --Refuse dumped in low lying areas as a method of reclamation of land. As a result of bacterial action, refuse decreases and converted to humus.

ii. Sanitary land filling-Trenches are excavated and filled the refuses to depth of 2 to 2.5 m , and covered with excavated earth.

iii. Incineration-involves burning combustible refuse in an incinerator. All sorts of bacteria, insects etc are destroyed and remaining non combustible ashes, metals etc have little sanitation problem.

iv. Composting-is a method of combined disposal of reuse and sludge which is a process of nature. Organic matter breakdown under bacterial action and results in formation of compost.

v. Ploughing in fields-Used only on small scale grinding and discharging to sewers. Refuse is well ground in house or commercial grinders and discharged into sewer.

vi. Salvaging-Removal of certain elements such as paper, rags, glass, plastics, scrap metals etc. from sewage having market value.

vii. Fermentation or biological digestion-In this garbage is placed in air tight sealed tanks for 10 days, and in presence of air for 15 or 20 days. Digested residue is stable and is good soil conditioner.

9) Write the necessity of solid waste management? OR What are the reasons for solid waste management?

i. The organic portion of solid wastes ferments and favours fly breeding

ii. Garbage in the refuse attracts rats

iii. Pathogens may be conveyed to man through flies and dust.

iv. Possibility of water pollution, if rain water passes through deposits of fermenting refuse.

v. Risk of air pollution or fire accident if there is accidental or spontaneous combustion of refuse.

vi. Piles of refuse are nuisance from aesthetic point of view

10) Name air pollution control devices?

i. Gravity setting chambers

ii. Cyclonic separators

iii. Electrostatic precipitators

iv. Fabric filters

11)Write causes of noise pollution?

i. Heavy and light road traffic noise from automobiles

ii. NOISE around airport, jet propulsion etc.

iii. Noise from construction site

iv. Noise from industrial machinery

v. Noise from household appliances

vi. Noise from train on steel bridge

vii. Noise from Atomic reactions and other explosions

viii. Noise from explosives

ix. Noise from electrical and thermal generating stations

12)Write short notes on Frequency rate, Severity rate and

incidence rate?

i. Frequency rate is defined as the number of accidents occured per million man hours worked in a year. Frequency rate=number of lost time accidents X 1000000/TOTAL NO. OF MAN HRS. WORKED

ii. Severity rate is defined as the number of man days lost per million man hours worked in a year. ie Severity rate =NUMBER OF MAN DAYS LOST X 1000000/TOTAL NUMBER OF MAN HOURS WORKED.

iii. Incidence rate is defined as the number of occupational injuries and /or illness of lost workdays per full hundred full time employees.ie Incidence rate=NUMBER OF INJURIESX10000/TOTAL NUMBER OF EMPLOYEES

13)Write relevant provisions of Factory Act 1948?

i. Licensing and registration

ii. health

iii. safety

iv. welfare

v. hours of work

vi. employment of young persons restrictions

vii. leave

14)What is smog?

Hydrocarbons and nitrogen oxides when in atmosphere under the influence of ultraviolet radiations in sunlight form ozone and variety of complex organic gases and particulates known as photo chemical smog.

15)Define air pollution?

Air pollution may be defined as the imbalance in the quality of air that causes ill effects. It may be defined as any gaseous, liquid, or solid material suspended in the air which creates an undesirable effect.

16)List causes of water pollution?

i. Industrial waste
ii. Sewage
iii. silt
iv. oil
v. thermal pollution
vi. fertilizers
vii. pesticides, herbicides, and fungicides
viii. radioactive wastes

17)Write reasons for air pollution?

i. automobile exhaust
ii. smoke from factory, domestic cooking, burning refuse etc.
iii. Ionizing radiation
iv. Sulphur dioxide
v. Aerosols which are certain chemicals released into the air under high pressure in the form of mist or vapour (from jet planes etc.)

18)Mention any two roles of trade union in safety organization?

i. GIve concrete suggestion to improve safety programme
ii. participate and cooperate known safety programme
iii. educate union members
iv. give first aid to needy persons(any 2)

19)Write effects of water pollution?

i. large amount of human waste in water increases gastro intestinal diseases, typhoid etc.

ii. more organic matter added to water cause oxygen to be used up .This adversely affects aquatic organisms and fishes

iii. Eutrohication due to organic pollutants

iv. excess pesticides causes bio-massification

v. high levels of organic chemicals make water unfit for drinking

vi. radio isotopes causes birth defects

vii. accidental oil spills from ships etc. cause environmental damage.

20)List the different water treatment processes?

PRELIMINARY TREATMENT- screening

Grinding

Skimming tank

Primary treatment - sedimentation

Secondary treatment- trickling filtration

Activated sludge process

Tertiary treatment coagulation

Membrane separation process

Filtration

Co-precipitation

GOOD LUCK