**DMI COLLEGE OF ENGINEERING**
**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**
**OME753 SYSTEM ENGINEERING**
**QUESTION BANK**

## UNIT-I
## INTRODUCTION TO SYSTEMS ENGINEERING

### 2 MARKS

1. What is System Engineering?

Systems engineering is an interdisciplinary approach and means to enable the realization of successful systems. It focuses on defining customer needs and required functionality early in the development cycle, documenting requirements, and then proceeding with design synthesis and system validation.

2. What is the role of System engineer?

Any engineer acts as a systems engineer when responsible for the design and implementation of a total system. The difference with "traditional engineering" lies primarily in the greater emphasis on defining goals, the creative generation of alternative designs, the evaluation of alternative designs, and the coordination and control of the diverse tasks that are necessary to create a complex system. The role of Systems Engineer is one of Manager that utilizes a structured value delivery process.

3. List out The major steps in the completion of a typical systems engineering project.

- Problem statement
- Identification of objectives
- Generation of alternatives
- Analysis of these alternatives
- Selection of one of them
- Creation of the system

- Operation.
-

4. Give some examples of Systems Engineering Process activities.
   - Defining needs, operational concept, and requirements
   - Functional analysis, decomposition, and allocation
   - System modeling, systems analysis, and tradeoff studies
   - Requirements allocation, traceability, and control
   - Prototyping, Integration, and Verification
   - System Engineering Product and Process control.

5. List out six stages in system development life cycle.

   There are usually six stages in this cycle:

   - Requirement analysis
   - Design
   - Development and testing
   - Implementation
   - Documentation
   - Evaluation.

6. What is Debugging?

   Debugging is the process of removing the errors that occurs during the coding part. Debugging is essential for this stage establishes the platform for further stages of development.

7. Define Documentation.

   Documentation is the process of writing down every stages and each and every details of the process of life cycle development so that anyone who follows this process may be able to do it in the real sense. Documenting the internal design of software for the purpose of future maintenance and enhancement is done throughout development.

8. What do you mean by maintenance in SDLC?

Maintaining the system is an important aspect of SDLC. Maintenance is the process of keeping the software in its fully functional form and see to that nothing goes wrong. Maintaining and enhancing software to cope with newly discovered problems.

9. What are the different types of SDLC models?

- Waterfall Model
- Software Prototyping
- Joint Applications Design (JAD)
- Rapid Application Development (RAD)

10. Give some strength and weakness of SDLC models.

It is easier to control the risks as high-risk tasks are completed first. The disadvantages to using the SDLC methodology are when there is need for iterative development. The risks may not be completely determined even at the final stage of the project.

11. List outs system engineering process steps.

There are four steps that comprise the SE Process are

- Requirement Analysis
- System Analysis Control
- Functional Analysis/Allocation
- Design Synthesis

12. Define framework.

A framework, or software framework, is a platform for developing software applications.

For example, a framework may include predefined classes and functions that can be used to process input, manage hardware devices, and interact with system software.

13. What is the purpose of framework in engineering?

The framework is used to survey state of the art research contributions and practice. The framework considers a task activity view of requirements, and

elaborates different views of requirements engineering (RE) depending on the starting point of a system development.

14. What are the advantages of frameworks?

Frameworks eliminate the need to write a lot of repetitive code that you will find being used in many different applications. The advantage of efficiency will never be underestimated. You can expect to build a project in much less time than would be achieved writing code without a framework.

15. Define software quality assurance (SQA).

Software Quality Assurance (SQA) is a set of activities for ensuring quality in software engineering processes. It ensures that developed software meets and complies with the defined or standardized quality specifications. SQA incorporates and implements software testing methodologies to test the software.

**16 MARKS**

1. Explain in detail about Life cycle of system Engineering.

- Feasibility Study
- Analysis
- Design
- Implementation
- Testing
- Training and Documentation
- Evaluation and Monitoring
- Maintenance

2. Explain about logical steps of System engineering in detail.

- Requirement Analysis
- System Analysis Control
- Functional Analysis/Allocation
- Design Synthesis

3. Explain about System Development lifecycle.

- Planning Stage

- Feasibility or Requirements of Analysis Stage
- Design and Prototyping Stage
- Software Development Stage
- Software Testing Stage
- Implementation and Integration
- Operations and Maintenance Stage

4. Explain about framework used in system engineering with framework architecture.

- Systems Engineering Vee Model(V-Model)
- INCOSE Systems Engineering Handbook Framework
- ISO/IEC 15288(Systems Life cycle Processes)
- Agile Systems Engineering
- Model-Based Systems Engineering(MBSE)

5. What is system engineering? Discuss about the system engineering process in detail.

Systems Engineering is a transdisciplinary and integrative approach to enable the successful realization, use, and retirement of engineered systems, using systems principles and concepts, and scientific, technological, and management methods.

- System Initiation
- System concept development
- System Requirement Analysis
- System Architecture and design
- Implementation and development
- Verification and Validation:
- System Integration and Testing:
- System Deployment and Operation:
- System Evaluation and Feedback:
- System Decommissioning (if applicable):

# UNIT – II
# SYSTEMS ENGINEERING PROCESSES

## 2 MARKS

1. What is system design?

Systems design is the process of defining elements of a system like modules, architecture, components and their interfaces and data for a system based on the specified requirements.

2. Give some examples of system design.

- Material Design – This is one of the most popular systems.
- Polaris – The Design System made by Shopify.
- Carbon – The one made by IBM.

3. What are types of system design?

There are two types of System Design, there are

- Architectural System Design
- Logical System Design

4. What are advantages and disadvantages of system design?

Advantage of system design:

- It eliminates inconsistencies.
- It speeds up the process.
- It makes the life of the customer easier and simpler.
- It provides a lot of resources.

Disadvantages of system design:

- One of the main disadvantages which is mostly overlooked is the risk of too much analyzing which may be costly and time consuming.

5. What is mean by functional analysis?

Functional analysis is a methodology that is used to explain the workings of a complex system. The basic idea is that the system is viewed as computing a function (or, more generally, as solving an information processing problem).

6. List out the types of functional analysis.

There are three types of Functional Assessment, there are

- Direct Observation
- Informant Methods
- Functional Analysis

7. Why was QFD developed?

QFD was developed in Japan in the late 1960s by Professors Yoji Akao and Shigeru Mizuno.

The Professors aimed at developing a quality assurance method that would design customer satisfaction into a product before it was manufactured. Prior quality control methods like Ishikawa were primarily aimed at fixing a problem during or after manufacturing.

8. What is Business process reengineering?

Business process reengineering (BPR) is the analysis and redesign of workflows within and between enterprises in order to optimize end-to-end processes and automate non-value-added tasks.

9. What is objective/purpose of BPR?

BPR focuses on processes and not on tasks, jobs or people BPR advocates that enterprises re-examines from basics aims at total re-invention not small improvements.

Example: “Hewlett Packard’s assembly time for server computers reduces to low-4 minutes”

10. List out some of the Reengineering principles.

- Organize around outcomes, not tasks.
- Identify all the processes in an organization and prioritize them in order of redesign urgency.
- Integrate information processing work into the real work that produces the information.
- Treat geographically dispersed resources as though they were centralized.

- Link parallel activities in the workflow instead of just integrating their results.
- Put the decision point where the work is performed, and build control into the process.
- Capture information once and at the source.

11. What are benefits of reengineering?

- Eliminates waste, and obsolete or inefficient process
- Significant reduction in cost and time
- Revolutionary improvements in many business processes as measured by quality and customer service
- Increasing the competency of both top and low level companies

12. What is QFD?

A system for translating customer requirements into appropriate company requirements at each stage from research and product development to engineering and manufacturing to marketing/sales and distribution

**13**. What is system synthesis?

a) System synthesis, also known as system design, translates the system functional architecture into a physical architecture. It creates a 'how' for every 'what' and 'how well'.

b) System synthesis is an iterative process - namely, as different physical architectures are considered functional or performance allocation may be changed to create a 'balanced' solution.

14. Distinguish between mission requirements and their derived or allocated subordinates.

Mission requirements: Mission requirements cannot be varied for system optimization. An example mission requirement: The space flight system shall have a mass of no more than 5,500 kg

Allocated or derived requirements :Allocated or derived requirements can be reallocated for system optimization.

15. Define coupling and cohesion.

Coupling - a measure of the relative dependence or information shared between subsystems.

Cohesion - a measure of the similarity of tasks performed within a subsystem.

16. What is Robustness?

Robustness is a measure of the ability of a system to absorb changes in requirements, constraints or failures while reducing the impacts on the performance, functionality, or composition of the mission or system. Two different design options are shown - one with high performance, one with robust performance.

**16 MARKS**

1. Explain briefly about business process Reengineering.

Phases:

According to Peter F. Drucker, ” Re-engineering is new, and it has to be done.” There are 7 different phases for BPR. All the projects for BPR begin with the most critical requirement i.e. communication throughout the organization.

- Begin organizational change.
- Build the re-engineering organization.
- Identify BPR opportunities.
- Understand the existing process.
- Reengineer the process
- Blueprint the new business system.
- Perform the transformation.

Objectives:

Following are the objectives of the BPR :

- To dramatically reduce cost.
- To reduce time requirements.
- To improve customer services dramatically.
- To reinvent the basic rules of the business e.g. The airline industry.
- Customer satisfaction.
- Organizational learning.

2. Explain briefly about Quality function Deployment.

1. Identify the customer
2. Determine customer requirements
3. Prioritize each requirement
4. Competitive benchmarking
5. Translate customer requirement into measurable Engineering specifications
6. Set target value for each engineering Specification

3. Explain about Functional analysis

- Direct Observation
- Informant Methods
- Functional Analysis

4. Explain the fame work for strategic analysis.

- Directions for strategy development
  - Penetration, consolidation, retrenchment
  - Product, Market development
  - Diversification
- Methods of strategy development
  - Internal (organic), acquisition, alliance
- Evaluating strategic choices

5. Explain about value system design and system synthesis.

- Material Design – This is one of the most popular systems. ...
- Polaris – The Design System made by Shopify.
- Carbon – The one made by IBM.

There are two types of System Design, there are

- Architectural System Design
- Logical System Design

# UNIT-III
# ANALYSIS OF ALTERNATIVES – I

1. What is meant by Analysis of alternatives?

An Analysis of Alternatives (AoA) is an analytical comparison of the operational effectiveness, suitability, and life-cycle cost of alternatives materiel solution that satisfy an established capability need identified in an Initial Capabilities Document (ICD).

2. What is CIA?

A family of techniques designed to evaluate changes in the probability of the occurrence of a given set of events consequent on the actual occurrence of one of them

- An analytical approach to the probabilities of an item in a forecasted set
- Its probabilities can be adjusted in view of judgments concerning potential interactions among the forecasted items

3. How will you estimate the probabilities in CIA?

The initial probability of an event can be expressed as follows:

P(l) = P(2) x P(1/2) + P(2c) x P(l/2c) (1)

where:

P(l) = probability that event I will occur; P(2) = probability that event 2 will occur;

P(1/2) = probability of event 1 given the occurrence of event 2;

P(2c) = probability that event 2 will not occur; and

P(1/2c) = probability of event 1 given the nonoccurrence of event 2.

4. Give strength and weakness of cross impact analysis.

STRENGTHS

- Cross-impact methods forces attention into chains of causality; a affects b; b affects c.
- Inserting a cross-impact matrix into another model often adds power to that model by bringing into its scope future external events that may, in the limit, change the structure of the model
- Estimate dependency and interdependency among events
- It can be used to clarify and increase knowledge on future developments

- Use of groups of experts ensures a number of opinions worth considering when calculating probabilities of events

WEAKNESSES

- This method assumes that, somehow and in some applications, conditional probabilities are more accurate than estimates of a priori probabilities; this is unproved.
- As any other techniques based on eliciting experts' knowledge, the method relies on the level of expertise of respondents.

5. List out the applications of CIA.

- Aircraft construction
- World geopolitical evolution
- The nuclear industry
- Corporate activities Jobs
- European automobile industry
- Softwood lumber industry in Canada
- Economy of Uruguay
- Future of Hong Cong

6. Define economic model.

An economic model is a mathematical or logical statement of economic theory. It is a method of analysis which presents an over-simplication of the real world. Economic Models can set up with diagrams, words, equation form, etc.

7. What is purpose of economic models?

- Predict & explain behavior
- Help to generate new ideas

8. List out the types of economic models

- Physical Models
- Analog Models
- Symbolic or Mathematical models

9. Give some advantages of economic models

- Models transform verbal expressions into scientific expressions.

- Standardized terminology.
- Models are logical.
- Models lend themselves to proper analysis and interpretation.
- The assumptions of a model are stated clearly.

10. What are characteristics of allocation model?

The characteristics of this model are as follows:

- funds in the model are explicitly defined.
- individual allocation percentages of each fund can be changed.

11. Define forward engineering.

Forward engineering is defined as the process of transforming a model into code through a mapping to an implementation language.

12. What is meant by reverse engineering?

Reverse engineering is defined as the process of transforming code into a model through mapping from a specific implementation language.

13. List out steps done in reverse engineering

a. Identify the rules of mapping from a specific language.
b. Use a tool; point the tool to the code.
c. Query the model to obtain desired information for the model.

14.What is classifiers? Give examples.

Classifier is the mechanism that describes structural and behavioral features.

Eg: classes, interface, use case, node, component

15. How visibility done in advanced modelling?

Public—access allowed for any outside classifier with visibility to the given classifier (+).

Protected—access allowed for any descendant of the classifier (#).

Private—access restricted to the classifier itself (-).

16. Give the syntax of attributes

Syntax

[ visibility ] name [ multiplicity ] [ : type ] [ = initial-value ] [ {property-string } ]

property-string

d. changeable—no restrictions (default)
e. addOnly—values may not be removed or altered, but may be added
f. frozen—may not be changed after initialization

17. Write syntax of operations

Syntax

[ visibility ] name [ (parameter-list ) ] [ : return-type ] [ (property-string) ]

parameter-list syntax

[ direction ] name : type [ = default-value ]

direction

in—input parameter; may not be modified
out—output parameter; may be modified
inout—input parameter; may be modified

18. Define NPV.

Net present value (NPV) is the difference between the present value of cash inflows and the present value of cash outflows over a period of time.

NPV is used in capital budgeting and investment planning to analyze the profitability of a projected investment or project.

19. How will you calculate NPV?

$$\mathrm{NPV} = \sum_{t=1}^{n} \frac{C_t}{(1+k)^t} - C_0$$

Ct=cash inflow in the period t

C0=cash outflow of today

K=required rate of return

T=time period

20. Give decision rule of NPV.

If the NPV is positive, accept the project

A positive NPV means that the project is expected to add value to the firm and will therefore increase the wealth of the owners.

21. Mention some disadvantages of payback period.

- Ignores the time value of money
- Requires an arbitrary cutoff point
- Ignores cash flows beyond the cutoff date
- Biased against long- term projects, such as research and development, and new projects

22. What is meant by IRR? Give its decision rule.

Definition: IRR is the return that makes the NPV = 0

Decision Rule: Accept the project if the IRR is greater than the required return

23. List out some problem associated with CBA.

- Measurement Problems
- Time Problems

24. Is IRR is always good choice?

- IRR is useful in deciding whether or no t to invest in a single project
- When multiple projects are being considered, IRR is not a good investment tool to use to evaluate which project to choose.
- The IRR calculation automatically assumes that all cash outflows are reinvested at the IRR, but doesn't evaluate what the investor does with cash inflows, which would have an effect on the true IRR.

25. What is meant by work breakdown structure?

A WBS is a deliverable-oriented grouping of project components that organizes and defines the total scope of the project

- Work not in the WBS is outside the scope of the project
- WBS is usually an operative tool used by contractors.

26. List out types of WBS.

- Project WBS
- Operative tool for monitoring and control contractor work
- Contractual WBS
- Defines the level of reporting that the seller will provide the buyer
- May include less detail than Project WBS
- Agreed between owner and contractor

**16 MARKS**

**1.** Explain about Cross Impact analysis Architecture.

- A family of techniques designed to evaluate changes in the probability of the occurrence of a given set of events consequent on the actual occurrence of one of them
- An analytical approach to the probabilities of an item in a forecasted set
- Its probabilities can be adjusted in view of judgments concerning potential interactions among the forecasted items
- Interrelationship between events and developments is called "cross-impact"
- The method tries to answer the question: can forecasting be based on perceptions about how future events may interact?
- Originally developed by Theodore Gordon and Olaf Helmer in 1966

2. Explain about Advanced Structured modeling.

- Classes
  - Attributes
  - Operations
  - Responsibility
- Modeling the vocabulary of a system
- Modeling the distribution of responsibilities
- Modeling non software things
- Modeling primitives types

3. Explain about ROI of System Engineering.

Definition of ROI

.Factors Influencing ROI in Systems Engineering:

1. System Performance:

2. Cost Management:
3. System Life Cycle:
4. Schedule and Time-to-Market:

- Quality and Reliability
- ROI Analysis in Systems Engineering:
- Decision-Making
- Continuous Monitoring:
- Risk Management:

4. Explain in detail about Economic model.

- Physical model
- Analog model
- Symbolic or Mathematical model

5. Explain Work and Cost Breakdown Structure

WORK PACKAGE

- Lowest level
- Distinguish from Others
- Single Responsible Organization
- Assigned Start and Finish
- Assigned Budget
- Limited Duration

**CBS**

- Breakdown of the costs of the various components of the structure including all work done by the subcontractors
- Serves as a basis for subsequent monthly pay requests by the contractor
- Used to continuously compare costs as they actually occur with the budget .

# UNIT-IV
# ANALYSIS OF ALTERNATIVES – II

1. What is Markov process used for?

Markov analysis is a method used to forecast the value of a variable whose predicted value is influenced only by its current state, and not by any prior activity. In essence, it predicts a random variable based solely upon the current circumstances surrounding the variable.

2. What are the characteristics of Markov process?

The defining characteristic of a Markov chain is that no matter how the process arrived at its present state, the possible future states are fixed. In other words, the probability of transitioning to any particular state is dependent solely on the current state and time elapsed.

3. What is Markov process in matrix?

A $n \times n$ matrix is called a Markov matrix if all entries are nonnegative and the sum of each column vector is equal to 1.

4. What is difference between random and stochastic process?

Literally there is no difference between 'Random' and 'Stochastic'. It can be said that, in a 'Stochastic Analyses' numbers are generated or considered 'Random'. So 'Stochastic' is actually a process whereas 'random' defines how to handle that process.

5. What are the four types of stochastic process?

Some basic types of stochastic processes include Markov processes, Poisson processes (such as radioactive decay), and time series, with the index variable referring to time. This indexing can be either discrete or continuous, the interest being in the nature of changes of the variables with respect to time

6. What are the 4 components of reliability?

There are four elements to the reliability definition: 1) Function, 2) Probability of success, 3) Duration, and, 4) Environment. Maintainability is related to reliability, as when a product or system fails, there may be a process to restore the product or system to operating condition.

7. What is meant by Analysis of alternatives?

An analysis of alternatives is an analytical comparison of the operational effectiveness, cost, and risks of proposed materiel solutions to gaps and shortfalls in operational capability. Such analyses document the rationale for identifying/recommending a preferred solution or solutions to the identified Shortfall.

8. List out the applications of CIA.

- Use preventive measures such as redundancy, failover and RAID. Ensure systems and applications stay updated.
- Use network or server monitoring systems.
- Ensure a data recovery and business continuity (BC) plan is in place in case of data loss.

9. Write the formula to find Availability of product.

Availability = Uptime ÷ (Uptime + downtime)

10. Define Forward Engineering.

Forward Engineering is a method of creating or making an application with the help of the given requirements. Forward engineering is also known as Renovation and Reclamation. Forward engineering requires high proficiency skills. It takes more time to construct or develop an application.

11. What are characteristics of allocation model?

The characteristics of this model are as follows: total funds in the model are explicitly defined for each asset class. Asset class allocation percent is fixed.within each asset class, individual allocation percentages of funds are editable.
the allocation percentage could be set to a default value.

12. Define Reliability and Maintainability.

While reliability characterizes how long an asset can operate without issues. Maintainability describes the likelihood the same asset can be restored once a failure does occur.

13. Mention some Network Terminology.

Three types of network traffic.

- Unicast involves communication from one singlepoint to another single point.

- Broadcast is when information is sent from a single point to multiple points.
- Multicast is communication of information from multiple points to other points.

14. What are the different types of reliability models?

Types of reliability models:

- serial system
- parallel-serial system
- serial-parallel system.

15. What is reliability formula?

Reliability is complementary to probability of failure, i.e. $R(t) = 1 - F(t)$ , or$R(t) = 1 - \Pi[1 - Rj(t)]$ . E9. For example, if two components are arranged in parallel, each with reliability $R_1 = R_2 = 0.9$, that is, $F_1 = F_2 = 0.1$, the resultant probability of failure is $F = 0.1 \times 0.1 = 0.01$.

16. What are the characteristics of availability?

Availability means the probability that a system is operational at a given time, i.e. the amount of time a device is actually operating as the percentage of total time it should be operating. High-availability systems may report availability in terms of minutes or hours of downtime per year.

17. Can a system have high reliability but low availability?

It is possible to have an equipment item with high reliability, but low availability if: Scheduled downtime is high (possibly due to excessively lengthy preventive maintenance) or. MTTR is high (it takes a long time to repair each failure)

18.Define Reliability

Generally defined as the ability of a product to perform as expected over time

- Formally defined as the probability that a product, piece of equipment, or system performs its intended function for a stated period of time under specified operating conditions.

19. Define Maintainability.

- Maintainability is the totality of design factors that allows maintenance to be accomplished easily
- Preventive maintenance reduces the risk of failure

- Corrective maintenance is the response to failures

20. .Explain the types of Reliability
- Inherent reliability – predicted by product design
- Achieved reliability – observed during use

21.Explain Availability function

OPerarional Availabilityt

$$A_O = \frac{MTBF}{MTBM + MDT}$$

Inherent Availability

$$A_O = \frac{MTBF}{MTBF + MTTR}$$

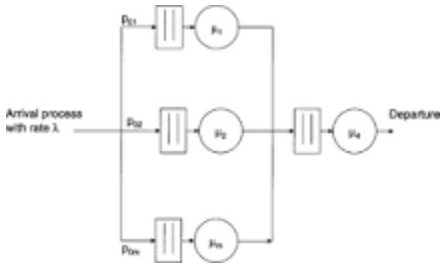
where
MTBF-Mean time between failure
MTBM-Meantime between Maintenance
MTTR-Meantime to repair
MDT-Mean down time

22. Define Regression analysis
- It is the study of the relationship between variables.
- It is one of the most commonly used tools for business analysis.
- It is easy to use and applies to many situations.

23. What is queuing theory in optimization techniques?

Queuing theory as an operations management technique is commonly used to determine and streamline staffing needs, scheduling, and inventory in order to improve overall customer service. It is often used by Six Sigma practitioners to improve processes.

24. What is queuing network model?




Queuing Networks (QN) are models where customers (service requests) arrive at service stations (servers) to be served. When customers arrive at a busy service station, they are queued for a waiting time until the service station is free. Both the arrival and service times are described as stochastic processes.

25. What are time series models?

A time series model, also called a signal model, is a dynamic system that is identified to fit a given signal or time series data. The time series can be multivariate, which leads to multivariate models.

26. What is the difference between time series and regression?

Regression: This is a tool used to evaluate the relationship of a dependent variable in relation to multiple independent variables. A regression will analyze the mean of the dependent variable in relation to changes in the independent variables. Time Series: A time series measures data over a specific period of time.

27. Define Time series forecasting

Time series forecasting is one of the most applied data science techniques in business, finance, supply chain management, production and inventory planning. Many prediction problems involve a time component and thus require extrapolation of time series data, or time series forecasting. Time series forecasting is also an important area of machine learning (ML) and can be cast as a supervised learning problem

**16 MARKS**

**1.** Explain in detail about Stochastic and Markov process.

- Stochastic Matrix
- Markov Process
- Markov Chain
- First Order Markov Chain
- Second Order Markov Chain

2. Explain evaluation of Large scale models.

- Complexity Management
- Simulation
- Data Integration
- Optimization
- Decision Support
- Validation and Verification
- Scalability
- Applications

3. Explain in detail about Queuing Network Optimization

- Performance Metrices
- Network Topology
- Arrival Patterns
- Optimization Techniques
- Trade-offs
- Queue Management
- Sensitivity Analysis
- Real world Applications
- Software tools

4. Explain in detail about regression models.

- Data Analysis
- Model Building

- Parameter Estimation
- Predictive modeling
- Quality control
- Root cause Analysis
- System design
- Risk Assessment

5. Explain in detail about Reliability.

- Standardization
- Redundancy
- Physics of failure
- Reliability testing
- Burn-in
- Failure mode and effects analysis
- Fault tree analysis

## UNIT-V
## DECISION ASSESSMENT

1. What are the 3 types of decision makers?

In most cases, the decision-making process for purchase of any product or service of significance is generally split among three types of decision maker:

- The Access Owner. ...
- The Problem Owner. ...
- The Budget Owner.

2. What are the types of Decisions?

Types of Decisions

- Strategic Decisions and Routine Decisions. ...
- Programmed Decisions and Non-Programmed Decisions. ...
- Policy Decisions and Operating Decisions. ...
- Organizational Decisions and Personal Decisions. ...
- Individual Decisions and Group Decisions.

3. How does decision analysis work?

Identify the problem. First, you need to identify the problem you want to solve the

- Decision you need to make. ...

- Research your options. ...
- Create a framework. ...
- Develop a decision model. ...
- Find the expected value.

4. What is the utility of a theory?

In economics, utility theory tries to explain the behavior of individual consumers in an economy. Utility theory argues that each person, given a list of options, can rank those options in a precise order of preference. Each person has different choices which are set, not changing over time.

5. What are three classes of systems engineering life cycles?

As discussed in the System Life Cycle Process Drivers and Choices article, those models described fall into three major categories: (1) primarily pre-specified single-step or multistep, also known as traditional or sequential processes; (2) evolutionary sequential (or the Vee Model) and (3) evolutionary opportunistic .

6. What are the types of systems engineering?

Four specific types of engineered system context are generally recognized in systems engineering: product system, service system , enterprise system and system of systems .

7. What are systems engineering principles?

These principles are: SE in application is specific to stakeholder needs, solution space, resulting system solution(s), and context throughout the system life cycle. SE has a holistic system view that includes the system elements and the interactions amongst themselves, the enabling systems, and the system environment.

8. What is the importance of systems engineering?

Systems Engineering helps avoid omissions and invalid assumptions, helps to manage real world changing issues, and produce the most efficient, economic and robust solution.

9. What is systems engineering project management?

While the project manager manages the project life cycle, the systems engineer manages the technical baseline of the product under development. The

project manager and systems engineer share requirements management responsibility, and by working closely together they keep the project on track.

10. Define social welfare function.

The social welfare function is analogous to the consumer theory of indifference-curve–budget constraint tangency for an individual, except that the social welfare function is a mapping of individual preferences or judgments of everyone in the society as to collective choices, which apply to all, whatever individual.

11. What are the functions of social welfare department?

The Department of Social Welfare provides welfare programmers and services to the persons with disabilities, social security for the aged and destitute through the network of residential care homes and non-institutional services.

12. What are group decision-making techniques?

Group decision-making techniques are strategies for structuring group members' interactions to enhance the quality of a collective decision. It is a set of rules or procedures that specify the process members should follow when contributing to a decision pertaining to their group.

13. What is importance of group decision-making?

Because the performance of a group involves taking into account the needs and opinions of every group member, being able to come to an equitable decision as efficiently as possible is important for the functioning of the group.

14. What is effective decision making?

Effective decision making is defined here as the process through which alternatives are selected and then managed through implementation to achieve business objectives. 'Effective decisions result from a systematic process, with clearly defined elements, that is handled in a distinct sequence of steps'.

15. What is Demand?

Demand is the quantity of a commodity which a consumer is willing and able to purchase at any given price, during some specific period of time.

16. Whatt is Brainstorming?

- process for gathering ideas pertaining a solution to a problem
- Developed by Alex F O Group borne to increase individual's synthesis capabilities
- Panel format
  - Leader: maintains a rapid flow of ideas
  - Recorder: lists the ideas as they are presented
  - Variable number of panel members (optimum 12

17. Define voting.

- In democracy most decisions are made in groups or by the community
- Voting is a possible way to make the decisions
  - Allows large number of decision makers
  - All DMs are not necessarily satisfied with the result
- The size of the group doesn't guarantee the quality of the decision
  - Suppose 800 randomly selected persons deciding on the materials used in a spacecraft

18. Define Risk Management:

- Risks will be identified and managed throughout the project. The following process will be used to manage risks:
- Identify potential risk events
- Analyze each risk event to determine its likelihood of occurrence and consequence to the project
- Prioritize by computing the risk level as a function of likelihood and consequence, and ranking

19. What are the advantages and disadvantages of group decision making?

| | Advantages | Disadvantages |
|---|---|---|
| 1 | Diversity in opinions | Consumption of Time |
| 2 | Participation and interest of the individuals' | Different ideas and opinions |

| | | |
|---|---|---|
| 3 | Positive and understanding members | Being silent in disagreement |
| 4 | The collective contribution of ideas | Social Pressures |

20. What method of decision-making is most effective?

Consensus or Voting on a course of action would be much more appropriate. Use the Consult method as a way to make efficient, informed decisions and gain ideas and support without delaying decision making. Use Vote if efficiency is the most important factor and when everyone agrees to support the outcome of the vote.

**16 marks**

1. Explain the five types of decision assessment efforts

- Technical Planning.
- Risk Management.
- Configuration Management.
- Information Management.
- Quality Management.
- Measurement.

2. Explain in detail about utility theory.

- Define the problem
- Identify the decision criteria
- Weight the criteria
- Generate alternatives
- Rate each alternative on each criterion
- Compute the optimal decision.

3. Explain in detail about group decision.

- Identify the decision to be made. ...
- Analyze the issue under discussion. ...
- Establish criteria. ...
- Brainstorm potential solutions. ...
- Evaluate options and select the best one. ...
- Implement the solution. ...
- Monitor and evaluate the outcome.

4. Explain in detail about Social welfare function.

- Restriction of "relevant" aspects of social state to each person (household)
- Knowledge of preferences of each person (household)
- Comparability of individual utilities
  - utility levels
  - utility scales
- An aggregation function W for utilities
  - contrast with constitution approach
  - there we were trying to aggregate orderings

5. Explain in detail about System Engineering Management.

- Technical Project Planning and the Control
- Systems Engineering Process
- Engineering Specialty Integration