

1. Determining how to build a machine involves the use of what?
 - a. Analysis
 - b. Replication
 - c. Construction
 - d. Design
2. The process of re-creating something that has already been designed is what?
 - a. Analysis
 - b. Replication
 - c. Construction
 - d. Design
3. Which of the following would **NOT** be considered a technical requirement for the blender (simple mechanical system) discussed in class?
 - a. 12.0 lb weight
 - b. 56-ounce capacity
 - c. Hard anodized aluminum housing
 - d. Extremely quiet
 - e. 0.9 HP motor
4. Which ideas can be thrown out in the conceptual design phase?
 - a. Overly complicated ideas
 - b. Ridiculous ideas
 - c. Expensive ideas
 - d. No ideas can be thrown out
5. What is the first stage of the design cycle?
 - a. Define overall objectives
 - b. Gather information
 - c. Model and analyze
 - d. Identify and evaluate possible design strategies
6. Which of the following is an idea trigger phase of a formal brainstorming session not intended to do?
 - a. Trigger new ideas by hearing ideas of others
 - b. Trigger team fighting over who had the idea first
 - c. Promote team discussion about ideas
 - d. Eliminate ideas from multiple people
7. A good design will:
 - a. Meet all technical requirements
 - b. Cost more than it should
 - c. Works initially, but stops working after a short time
 - d. Raises ethical questions
8. When gathering information, a good place to look is:

- a. The internet
 - b. Magazines
 - c. Engineering publications
 - d. All of the above
9. After gathering information, the next step is to:
- a. Choose a design strategy
 - b. Make a first cut at the design
 - c. Model and analyze
 - d. Build, document, test
10. The precision of any calculation is determined by the least precise number in the computation is an example of:
- a. Using the wrong data in calculation
 - b. Significant figures
 - c. Rounding errors
 - d. Improper data collection
11. Which of the following graphs are commonly used by engineers when plotting data?
- a. Semi-log plots
 - b. Log-log plots
 - c. Polar plots
 - d. All of the above
12. Engineering encompasses which of the following?
- a. Implementing design solutions
 - b. Sustaining solutions across the life cycle
 - c. Disposing of resulting systems
 - d. Design
 - e. All of the above
13. Prototypes are **NOT** used for:
- a. Developing the problem statement and identifying customer requirements
 - b. Assessing size, appearance, and concept
 - c. Evaluating performance
 - d. Feedback to the design process
14. A good design will:
- a. Meet cost requirements
 - b. Poses a hazard to users
 - c. Cost more than it should
 - d. Meet only some technical requirements

15. Reverse engineering can be a useful tool. Which of the following is an example of a useful way it is used?
- a. Reverse engineering a competitor's product in order to steal their design.
 - b. Claiming to reverse engineer in order to purposefully destroy a product.
 - c. Reverse engineering a product of your company in order to better understand its function if it is not well documented.
16. When the behavior of a dynamic system is needed instead of finite element analysis, which of the following is not the best to use?
- a. Matlab
 - b. Excel
 - c. Solidworks
 - d. Mathcad
17. Managing a project sensibly does NOT include:
- a. writing things down so you don't forget them
 - b. identifying the faults of the group members
 - c. completing tasks on time
 - d. holding regular meetings to discuss progress
18. A typical job description might contain:
- a. Job title
 - b. Immediate supervisor
 - c. Grade level
 - d. list of responsibilities
 - e. all of the above
19. Time management is critical to the success of any engineering project.
- a. True
 - b. False
20. PERT stands for Project Evaluation and Review Technique.
- a. True
 - b. False
21. Technical reports may contain which of the following:
- a. Test results
 - b. Design parameters
 - c. Theory
 - d. Calculations
 - e. All of the above
22. When engineers work in a team, all members maintain a single engineering notebook.
- a. True
 - b. False

23. Over what percentage of world's current energy needs are derived from petroleum products:

- a. 70%
- b. 50%
- c. 35%
- d. 95%

24. Experience is acquired by:

- a. Testing prototypes
- b. Studying failures
- c. Observing results of design decisions
- d. None of the above
- e. All of the above

25. The key to successful engineering is:

- a. A broad multidisciplinary education
- b. More theoretical knowledge of subject and less practical knowledge
- c. More practical knowledge of subject and less theoretical knowledge
- d. None of the above

26. Nuclear engineers use what knowledge to solve engineering problems?

- a. Atomic physics
- b. Nucleus
- c. Electrons
- d. Theory of relativity

27. Two important elements of Mechatronics are:

- a. Pneumatics and hydraulics
- b. Breadboards and soldering
- c. Sensing and actuation
- d. None of the above

28. The field that best compliments a mechanical engineering education is:

- a. Electronics Engineering
- b. Civil Engineering
- c. Computer Science Engineering
- d. Electrical Engineering

29. Important skills that lie at the foundation of engineering is (or) are:

- a. Stress and vibration analysis
- b. Knowledge, Experience, and Intuition
- c. Computer programming and coding
- d. Time management and organization

Exam scored with only b. as the correct answer. Accepting both b. and d. Two points given to all students who took the exam.

30. Which of the following represents a customer requirement translated into a technical requirement?

- a. Comfortable seat – 4-inch-thick closed cell polyurethane foam with spring-loaded seat chassis
- b. Low noise – multiple speeds
- c. 200 lb weight – easy to carry
- d. All of the above

Use the Weighted Decision Matrix to answer the following two questions:

Weighted Decision Matrix Example

Concept		A		B		C		D		E	
Criteria	Weight	Raw	Wtd	Raw	Wtd	Raw	Wtd	Raw	Wtd	Raw	Wtd
I	1	2	2	3	3	1	1	2	2	2	2
II	2	1	2	1	2	3	6	3	6	3	6
III	1.5	4	6	4	6	3	4.5	0	0	2	3
IV	2	2	4	2	4	4	8	2	4	3	6
V	3	1	3	2	6	1	3	4	12	2	6
Totals:											

Scale:

- 4 Far Exceeds requirement
- 3 Exceeds requirement
- 2 Meets requirement
- 1 Minor deficiencies
- 0 Does not meet requirement

31. In the weighted decision matrix, which concept receives the highest total?

- a. A
- b. B
- c. C
- d. D
- e. E

32. In the weighted decision matrix, if all criteria must be met in some capacity, which concept would rank highest?

- a. A
- b. B
- c. C
- d. D
- e. E

33. Traditionally, the only feedback in the design loop might be from:

- a. marketing back to research
- b. research team to manufacturing
- c. manufacturing to marketing
- d. none of the above

34. To be patentable, a new invention must pass the test of:

- a. Obviousness
- b. Uniqueness
- c. Strength
- d. Aerodynamic test

Exam scored incorrectly with a. as the correct answer. The answer is b. Two points given to all students who took the exam.

35. A graphic depiction of a work plan with tasks, durations, and relationships is:

- a. Decision Matrix
- b. Vibration Analysis
- c. Gantt Chart
- d. Organizational Chart

36. A back of envelope calculation is a detailed and lengthy engineering analysis intended to estimate performance.

- a. True
- b. False

37. Benchmarking is:

- a. A formal or informal method for generating ideas
- b. Research to determine if and how the problem has been solved by other people
- c. A process of analyzing strength requirements
- d. None of the above

38. Product life cycle costs are flat during the sustainment phase.

- a. True
- b. False

39. Which of the following is **NOT** a 20th century engineering achievement?

- a. The Internet
- b. Steam powered locomotive
- c. Agricultural Mechanization
- d. Fiber Optics

Exam scored with only b. as the correct answer. Accepting both b. and c. Two points given to all students who took the exam.

40. A good engineer relies on outside sources completely, without verifying the truth of the information or relevance to the project.

- a. True
- b. False

41. Engineering drawings are:
- a. Used to communicate technical information about the design to downstream parties in the manufacturing process
 - b. Not usually revised or controlled
 - c. Inclusive of all material specifications, feature sizes and locations, and overall dimensions
 - d. A & C
 - e. A & B
42. Testing is used to determine if the design meet the requirements via demonstration in a simulated or actual usage environment.
- a. True
 - b. False
43. Design Realization is the part of the design process in which:
- a. The team “unpacks” the selected design, moving from generic to specific
 - b. Moves from concept to engineering design
 - c. Uses sources like books, journals, industry publications, and colleagues to collect information
 - d. All of the above
44. According to the book, which of the following uses of the word design will be used?
- a. As a verb
 - b. As a noun
 - c. As an adjective
 - d. All of the above
45. The evaluation of data, often through the use of mathematics, is called what?
- a. Replication
 - b. Construction
 - c. Analysis
 - d. Design