ESE-2018 PRELIMS TEST SERIES

Date: 28th October, 2017

GS–TEST 5(OBJECTIVE SOLUTION)...

ANSWERS

1.	(a)	21.	(a)	41.	(c)	61.	(c)	81.	(b)
2.	(a)	22.	(b)	42.	(d)	62.	(c)	82.	(d)
3.	(c)	23.	(b)	43.	(c)	63.	(c)	83.	(d)
4.	(a)	24.	(a)	44.	(b)	64.	(d)	84.	(b)
5.	(b)	25.	(c)	45.	(d)	65.	(d)	85.	(a)
6.	(b)	26.	(d)	46.	(d)	66.	(b)	86.	(a)
7.	(b)	27.	(d)	47.	(c)	67.	(c)	87.	(d)
8.	(c)	28.	(b)	48.	(c)	68.	(c)	88.	(a)
9.	(c)	29.	(b)	49.	(a)	69.	(d)	89.	(a)
10.	(d)	30.	(c)	50.	(d)	70.	(b)	90.	(d)
11.	(a)	31.	(a)	51.	(a)	71.	(d)	91.	(c)
12.	(a)	32.	(d)	52.	(c)	72.	(b)	92.	(c)
13.	(a)	33.	(b)	53.	(d)	73.	(d)	93.	(c)
14.	(a)	34.	(d)	54.	(d)	74.	(a)	94.	(c)
15.	(b)	35.	(a)	55.	(b)	75.	(c)	95.	(a)
16.	(b)	36.	(a)	56.	(c)	76.	(d)	96.	(b)
17.	(b)	37.	(d)	57.	(d)	77.	(c)	97.	(a)
18.	(a)	38.	(d)	58.	(b)	78.	(d)	98.	(d)
19.	(a)	39.	(d)	59.	(d)	79.	(c)	99.	(d)
20.	(a)	40.	(d)	60.	(d)	80.	(c)	100.	(b)

1. (a)

2. (a)

Lettering on a drawing sheet should have all alphabets in capital letters.

3. (c)

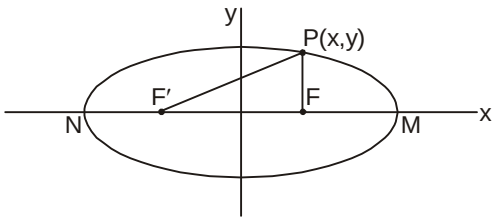
4. (a)

$$\text{R.F.} = \frac{\text{Length of drawing}}{\text{Actual length of an object}}$$

$$\text{R.F.} = \sqrt{\frac{\text{Area of drawing}}{\text{Actual area}}} = \sqrt{\frac{X^2}{Y^2}}$$

$$\text{R.F.} = \sqrt{\frac{\text{Volume of drawing}}{\text{Actual volume}}} = \sqrt{\frac{X^3}{Y^3}}$$

5. (b)



For simplicity in arriving the property,

Consider the point M on ellipse instead of considering a general point P(x, y)

Now sum of distance of any point from two foci be 'd'

$$d = MF' + MF \quad \ldots (i)$$

$$MF' = F'F + MF$$

Also

$$MF = NF'$$

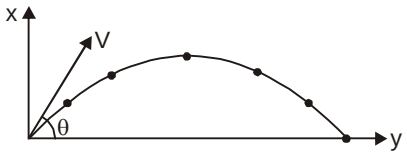
$$\Rightarrow \quad MF' = F'F + NF'$$

Putting in (i)

$$d = F'F + NF' + MF$$

$$= \text{major axis}$$

6. (b)



$$x = v\cos\theta t$$

$$y = v\sin\theta t - \frac{1}{2}gt^2$$

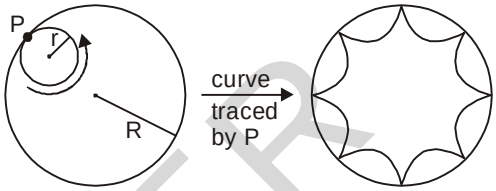
$$t = \frac{x}{v\cos\theta}$$

$$y = x\tan\theta - \frac{1}{2}g\frac{x^2}{v^2}\sec^2\theta$$

$$y = x\tan\theta - \frac{gx^2\sec^2\theta}{2v^2}$$

(Parabolic equation)

7. (b)

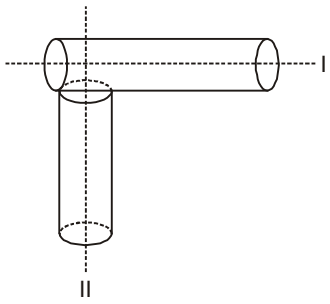


Parametric equation $\equiv x$

$$= (R-r)\cos\theta + r\cos\alpha$$

$$y = (R-r)\sin\theta - r\sin\alpha$$

8. (c)



9. (c)

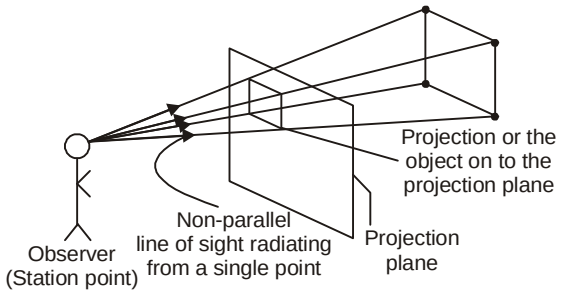
Auxilliary view is not the principal view

10. (d)

11. (a)

Perspective Projection:

In convergent projection, projectors are not parallel rather converges at a point called 'station point' and this point must coincide with observer's eye. The view is obtained when plane of projection (POP) is between object and the observer.

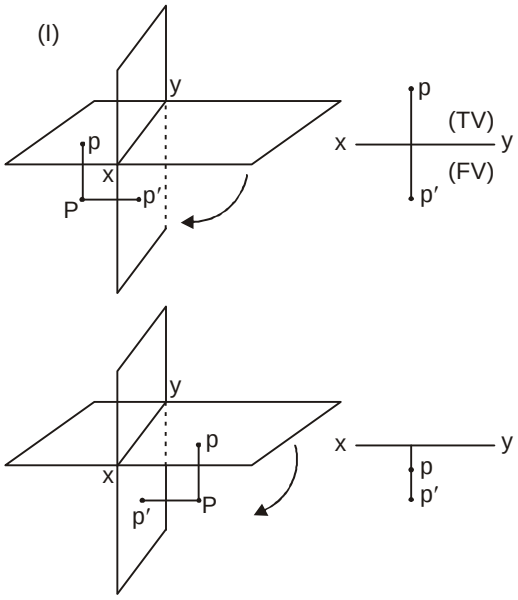


12. (a)

The lines which are parallel to isometric axis are called as isometric lines. The lines which are not parallel to isometric axis are called non isometric lines

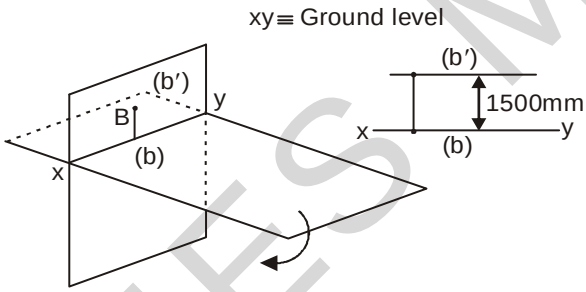
13. (a)

If a point is in fourth quadrant, its elevation will be below XY line.

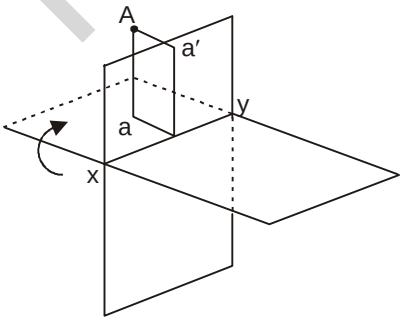


14. (a)

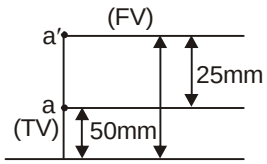
XY ≡ Ground level



15. (b)



(a) Pictorial view of point in second quadrant



(b) Orthographic view of point in second quadrant

16. (b)

If a given point is in front of the VP, its top view is below the XY line. If the given point is behind the VP, its top view is above the XY line.

17. (b)

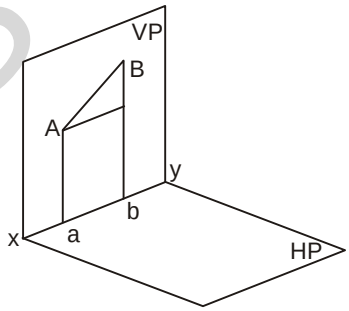
A trace is a point at which the line or its extension meets the HP or the VP.

18. (a)

19. (a)

A line is parallel to VP and inclined to HP it will have horizontal trace.

20. (a)



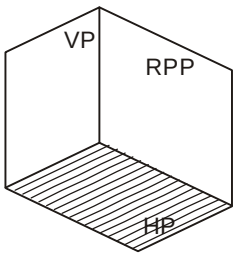
21. (a)

22. (b)

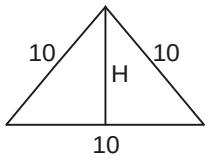
When a pentagonal plane is perpendicular to both HP and VP, then it is obvious that it must be parallel to the RPP.

Projection on HP gives the top view.
Projection on VP gives the front view.
Projection on RPP gives the side view.
Since the pentagonal plane is parallel to the RPP so the true shape will be depicted by the side view.

So, (b) is the correct answer.



23. (b)



$$A = \frac{\sqrt{3}}{4}(10)^2 = \frac{1}{2}\times 10 \times H$$

$$\frac{\sqrt{3}}{4}\times 100 = \frac{1}{2}\times 10 \times H$$

$$H = 5\sqrt{3}$$

$$= 1.732 \times 5$$

$$= 8.660$$

24. (a)

Vertical trace is the intersection of the extended line with VP.

25. (c)

Vertical trace : the point of intersection of the line or its extension with the VP if it is inclined to VP.

26. (d)

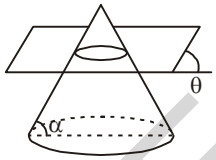
27. (d)

28. (b)

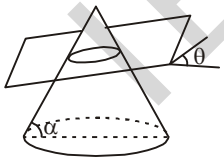
29. (b)

30. (c)

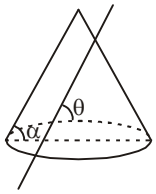
31. (a)



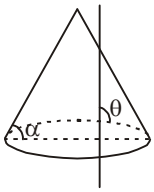
$\theta = 0$
$\Rightarrow$ Conic section is circle



$\theta < \alpha$
$\Rightarrow$ Conic section is ellipse



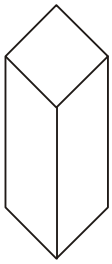
$\alpha = \theta$
$\Rightarrow$ Conic section is parabola



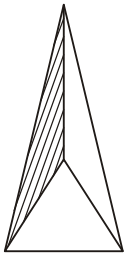
$\theta > \alpha$
$\Rightarrow$ Conic section is hyperbola

32. (d)

33. (b)



Prisms



Pyramids

A prism is a polyhedron having two equal ends called bases parallel to each other. The two bases are joined by faces, which are rectangular in shape.

A pyramid is a polyhedron having one base, with a number of isosceles triangular faces, meeting at a point called the apex.

The pyramid is named after the shape of its base.

34. (d)

A polygon is a solid bounded by plane surfaces and a polyhedron is said to be regular if its surface are regular polygons.

Tetrahedron – 4Δs

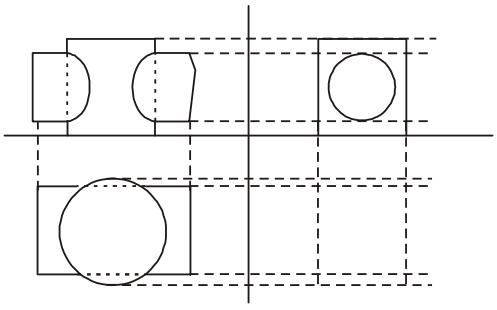
Hexahedron – $6\square$

Octahedron – 8Δ

Dodecahedron – $12\pentagon$ (12 equal pentagonal planes)

35. (a)

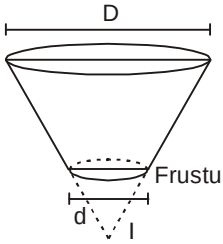
36. (a)

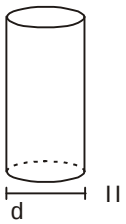


37. (d)

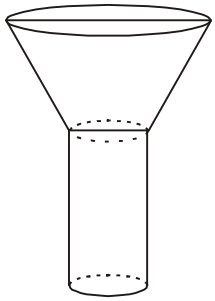
38. (d)

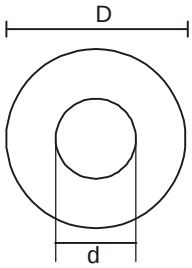
39. (d)





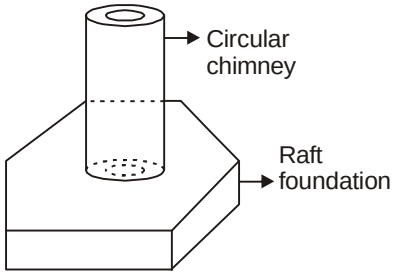
Joining I and II



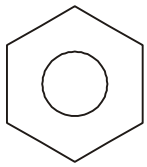


Front view

40. (d)

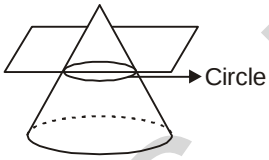


From top



Top view show plane of junction

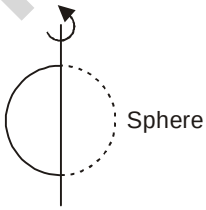
41. (c)



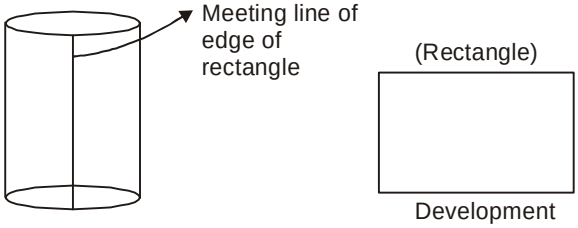
42. (d)

Hatching lines are generally inclined at 45°. When a sphere is cut by a plane inclined to at 30° to HP, the true shape of section is circle.

43. (c)



44. (b)



45. (d)

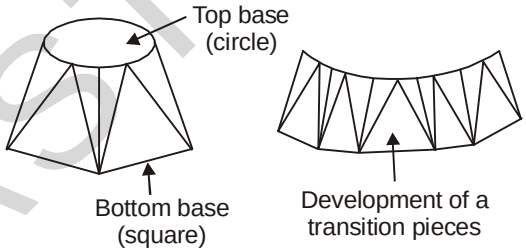
If a cutting plane cuts only the lateral edges of a prism, then only remaining part is developed. there is no need to draw the development of left out section. Hence statement I is correct.

A household funnel is an example of intersection of a cone and cylinder. Hence statement II is correct.

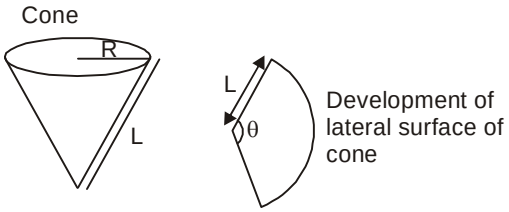
Intersection of two square prism shows a straight line segmented curve. Hence statement III is correct.

46. (d)

Triangulation development : This method is used to draw the development of transition pieces by dividing a surface into a number of triangles and transferring them into the development.



47. (c)



$$\theta = \frac{r}{l} \times 360°$$

Where R = base circle radius and L = slant height

48. (c)

Parallel line method of development is employed for cubes, prisms and cylinders in which all edges/generators of lateral surfaces are parallel to each other.

49. (a)

The cutting points on the lateral edges or generators of a pyramid or cone are transferred to the true slant edge or generator and then transferred to the development sketch.

50. (d)

Good design requires both analysis and synthesis. Typically we approach complex problems like design by decomposing the problem into manageable parts. Because we need to understand how the part will perform in service, we must be able to calculate as much about the part's expected behavior as possible before it exists in physical form by using the appropriate disciplines of science and engineering science and the necessary computational tools. This is called analysis. It usually involves the simplification of the real world through models. Synthesis involves the identification of the design elements that will comprise the product, its decomposition into parts, and the combination of the part solutions into a total workable system.

51. (a)

Embodiment design is concerned with three major tasks—product architecture, configuration design, and parametric design.

- Determining product architecture : Product architecture is concerned with dividing the overall design system into subsystems or modules. In this step we decide how the physical components of the design are to be arranged and combined to carry out the functional duties of the design.
- Configuration design of parts and components : Parts are made up of features like holes, ribs, splines, and curves. Configuring a part means to determine what features will be present and how those features are to be arranged in space relative to each other
- Parametric design of parts: Parametric design starts with information on the configuration of the part and aims to establish its exact dimensions and tolerances. An important aspect of parametric design is to examine the part, assembly, and system for design robustness.

Design Review is a part of Phase I. Conceptual Design of Design Process.

52. (c)

The design review is a vital aspect of the design process. It provides an opportunity for specialists from different disciplines to interact with generalists to ask critical questions and exchange vital information. A design review is a retrospective study of the design up to that point in time. It provides a systematic method for identifying problems with the design, determining future courses of action, and initiating action to correct any problem areas.

53. (d)

Environmental issues are given higher priority in design. Products must be designed to make them easier to reuse, recycle, or incinerate—a concept often called green design. 1 Green design also involves the detailed understanding of the environmental impact of products and processes over their entire life cycle. For example, life-cycle analysis would be used to determine whether paper or plastic grocery bags are more environmentally benign.

Social-ware refers to the patterns of organization and management instructions needed for the hardware to function effectively. It seems clear that the future is likely to involve more technology, not less, so that engineers will face demands for innovation and design of technical systems of unprecedented complexity. While many of these challenges will arise from the requirement to translate new scientific knowledge into hardware, others will stem from the need to solve problems in "social-ware."

54. (d)

The keys to creating a winning product are:

- Designing a quality product with the features and performance desired by its customers at a price they are willing to pay
- Reducing the cost to manufacture the product over its life cycle
- Minimizing the cost to develop the product
- Quickly bringing the product to market

55. (b)

From a global viewpoint, we should recognize that there is a hierarchy of human needs that motivate individuals in general:

Rank of 1. **Physiological needs** such as thirst, hunger, sex, sleep, shelter, and exercise. These constitute the basic needs

of the body, and until they are satisfied, they remain the prime influence on the individual's behavior.

Rank of 2. **Safety and security needs**, which include protection against danger, deprivation, and threat. When the bodily needs are satisfied, the safety and security needs become dominant.

Rank of 3. **Social needs** for love and esteem by others. These needs include belonging to groups, group identity, and social acceptance.

Rank of 4. **Psychological needs** for self-esteem and self-respect and for accomplishment and recognition.

Rank of 5. **Self-fulfillment** needs for the realization of one's full potential through self-development, creativity, and self-expression.

56. (c)

These descriptions are a set of engineering characteristics that are defined as follows:

- Design Parameters : Parameters are a set of physical properties whose values determine the form and behavior of a design. Parameters include the features of a design that can be set by designers and the values used to describe the performance of a design. Note: It must be clear that designers make choices in an attempt to achieve a particular product performance level, but they cannot guarantee they will succeed until embodiment design activities are finalized.
- Design Variable : A design variable is a parameter over which the design team has a choice. For example, the gear ratio for the RPM reduction from the rotating spindle of an electric motor can be a variable.
- Constraints : A design parameter whose value has been fixed becomes a constraint during the design process. Constraints are limits on design freedom. They can take the form of a selection from a particular color scheme, or the use of a standard fastener, or a specific size limit determined by factors beyond the control of both the design team and the customers.

57. (d)

The concept of modularization is used for reducing the complexity of a system.

Standardization is the process of implementing and developing technical standards based on the consensus of different parties that include firms, users, interest groups, standards organizations and governments. It can reduce, increase and modify the design complexity according to the standard.

Communality is the state or condition of being communal, i.e. shared by all members of a community; for common use, which sometimes reduce the design complexity.

Diversification is the process of a company enlarging or varying its range of products or field of operation.

58. (b)

In working toward an acceptable problem definition, the team uses Brainstorming, the Affinity diagram and Pareto Chart.

Brainstorming is a group creativity technique by which efforts are made to find a conclusion for a specific problem by gathering a list of ideas spontaneously contributed by its members.

An **Affinity Diagram** is a tool that gathers large amounts of language data (ideas, opinions, issues) and organizes them into groupings based on their natural relationships. The Affinity process is often used to group ideas generated by Brainstorming.

A **Pareto chart**, named after Vilfredo Pareto, is a type of chart that contains both bars and a line graph, where individual values are represented in descending order by bars, and the cumulative total is represented by the line.

Flowchart is a diagram of the sequence of movements or actions of people or things involved in a complex system or activity, which is used in analyzing the data.

59. (d)

The major decisions that are made over the life cycle of a project fall into four areas: performance, time, cost, and risk.

- Performance : The design must possess an acceptable level of operational capability or the resources expended on it will be wasted. The design process must generate

satisfactory specifications to test the performance of prototypes and production units.

- Time : In the early phases of a project the emphasis is on accurately estimating the length of time required to accomplish the various tasks and scheduling to ensure that sufficient time is available to complete those tasks. In the production phase the time parameter becomes focused on setting and meeting production rates, and in the operational phase it focuses on reliability, maintenance, and resupply.
- Cost : The importance of cost in determining what is feasible in an engineering design has been emphasized in earlier chapters. Keeping costs and resources within approved limits is one of the chief functions of the project manager.
- Risk : Risks are inherent in anything new. Acceptable levels of risk must be established for the parameters of performance, time, and cost, and they must be monitored throughout the project.

60. (d)

Data is a set of discrete, objective facts about events. These data may be experimental observations about the testing of a new product, or data on sales that are part of a marketing study.

Information is data that has been treated in some way that it conveys a message. Data becomes information when its creator adds meaning.

Knowledge is broader, deeper, and richer than data or information. Because of this it is harder to define. It is a mix of experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information.

61. (c)

Perceptual blocks have to do with not properly defining the problem and not recognizing the information needed to solve it. These blocks are listed below:

- Stereotyping : Thinking conventionally or in a formulaic way about an event, person, or way of doing something. As a result, it is difficult to combine apparently unrelated images into an entirely new creative solution for the design.
- Information overload : You become so overloaded with minute details that you are unable to sort out the critical aspects of the problem. This scenario is termed “not being able to see the forest for the trees.”
- Limiting the problem unnecessarily: Broad statements of the problem help keep the mind open to a wider range of ideas.
- Fixation : People’s thinking can be influenced so greatly by their previous experience or some other bias that they are not able to sufficiently recognize alternative ideas.
- Priming or provision of cues: If the thinking process is started by giving examples or solution cues, it is possible for thinking to stay within the realm of solutions suggested by those initial starting points. This is known as the conformity effect.

62. (c)

Strengths of TRIZ

- The principles at the heart of TRIZ are based on designs that are certified as inventive through the patent-type system of the country of the inventor.
- The developers of TRIZ continued to expand their database of inventive designs beyond the original 200,000.
- A dedicated TRIZ user community continues to expand the examples of inventive principles, keeping the TRIZ examples contemporary.

Weaknesses of TRIZ

- Inventive Principles are guidelines subject to designer interpretation.
- The principles are too general for application in a particular design domain, especially in newly developed areas like nanotechnology.
- The designer must develop her own analogous design solution for the given problem, even with an example of an Inventive Principle in the same technical application domain.
- There are differences in the interpretation of TRIZ concepts.
- There are aspects of TRIZ that are less intuitive, less available in application examples, and largely overlooked. TRIZ includes techniques for representing technical systems graphically for additional

insight and solution. This strategy is called Su-Field Analysis.

63. (c)

There are five basic patterns by which people cope with the challenge of decision making:

1. Unconflicted adherence: Decide to continue with current action and ignore information about risk of losses.
2. Unconflicted change: Uncritically adopt whichever course of action is most strongly recommended.
3. Defensive avoidance: Evade conflict by procrastinating, shifting responsibility to someone else, and remaining inattentive to corrective information.
4. Hypervigilance: Search frantically for an immediate problem solution.
5. Vigilance: Search painstakingly for relevant information that is assimilated in an unbiased manner and appraised carefully before a decision is made.

64. (d)

Analyzing performance is an important step in conceptual design. In evaluating competing concepts, it is necessary to analyze information obtained from models of various sorts. Models fall into three categories: iconic, analog, and symbolic.

An **iconic model** is a physical model that looks like the real thing but is a scaled representation. Generally the model scale is reduced from the real situation, as in a scale model of an aircraft for wind tunnel tests.

Analog models are models that are based on an analogy, or similarity, between different physical phenomena. This approach allows the use of a solution based in one physical science discipline.

Symbolic models are abstractions of the important quantifiable components of a physical system that use symbols to represent properties of the real system. A mathematical equation expressing the dependence of the system output parameter on the input parameters is a common symbolic or mathematical model.

65. (d)

The architecture of the product is given by the relationships among the components in the product and the functions the product performs. There are two entirely opposite styles of product architecture, modular and integral.

In an integral architecture the implementation of functions is accomplished by only one or a few modules. In integral product architectures, components perform multiple functions.

In a modular architecture, each module implements only one or a few functions, and the interactions between modules are well defined.

66. (b)

Combining aims to make one component replace multiple components or serve multiple functions. This is a move toward integral architecture, which we have seen is beneficial in reducing part count, and therefore lowering manufacturing and assembly costs.

Decomposing is the opposite approach from combining. As new components and assemblies are developed through decomposing, it is important to consider whether the new configurations affect your understanding of the constraints on and connections between each component.

Magnifying involves making some feature of a component larger relative to adjacent components.

Minifying involves making some feature of a component smaller. In the limit, it means eliminating the component if its function can be provided for in some other way.

Rearranging involves reconfiguring the components or their features. Changes in shape force rethinking of how the component carries out its functions. Another way to stimulate new ideas is to rearrange the order of the functions in the functional flow.

67. (c)

FMEA is a methodology for determining all possible ways that components can fail and establishing the effect of failure on the system. The team should consider questions such as: What will success look like? What is the timeline? The FMEA provides the metrics or control plan. The goal of the preparation is to have a complete understanding of the process you are

analyzing. What are the steps? What are its inputs and outputs? How are they related?

68. (c)

A tolerance is the acceptable variation in the dimension. Tolerances must be placed on a dimension or geometric feature of a part to limit the permissible variations in size because it is impossible to repeatedly manufacture a part exactly to a given dimension. A small (tight) tolerance results in greater ease of interchangeability of parts and improved functioning. Tighter tolerances result in less play or chance for vibration in moving parts. However, smaller (tighter) tolerances are achieved at an increased cost of manufacture. Larger (looser) tolerances reduce the cost of manufacture and make it easier to assemble components, but often at the expense of poorer system performance.

69. (d)

Rapid prototyping (RP) is a technology that produces prototypes directly from computer-aided design (CAD) models in a fraction of the time required to make them by machining or molding methods. Another name for RP is solid freeform fabrication. RP is used for producing the final proof-of-concept model and is used extensively in embodiment design to check form, fit, and function.

70. (b)

The Monte Carlo method is a way generating information for a simulation when events occur according to a probability distribution. (When events occur randomly, they are following a uniform probability distribution. A Monte Carlo simulation uses unrestricted random sampling (it selects items from a population in such a way that each item in the population has an equal probability of being selected) in a computer simulation in which the results are generated repeatedly to develop statistically reliable answers. This technique employs random numbers (a collection of random digits) that are generated by the computer.

71. (d)

Materials are selected on the basis of four general criteria:

- Performance characteristics (properties)
- Processing (manufacturing) characteristics
- Environmental profile
- Business considerations

72. (b)

There are four predominant situations where wear occurs:

- Adhesive wear occurs when two solid bodies are in contact and move relative to each other. The motion can be either sliding, rolling, or by impact.
- Abrasive wear occurs when hard particles slide or roll across a surface under pressure.
- Erosion is the loss of material from a solid surface due to the interaction of that surface with a fluid. The fluid may be a multi-component fluid like steam, or a stream of solid particles.
- Surface fatigue is a form of damage in which particles of metal are detached from a surface under cyclic stresses, causing pitting or spalling. The most common occurrences of surface fatigue are in rolling-contact systems, as in gear teeth and bearings, and fretting fatigue where there is small-amplitude oscillating motion between the surfaces.

73. (d)

The following physical properties will lead to high mismatch strains on quenching:

- Low thermal conductivity, k
- High specific heat, c
- High density, ρ
- High coefficient of thermal expansion, α

The first three factors can be combined into the thermal diffusivity $D = k/\rho c$. Low values of thermal diffusivity lead to high strain mismatch.

74. (a)

The level of risk, as perceived by an individual or the public, can be classified as tolerable, acceptable, or unacceptable.

- Tolerable risk: Indicates that people are prepared to live with the level of risk but want to continue to review its causes and seek ways of reducing the risk.
- Acceptable risk: Indicates that people

accept the level of risk as reasonable and would not seek to expend much in resources to reduce it further. An acceptable risk is one that satisfies the general public. This is often influenced by the decisions of relevant government regulating agencies.

- Unacceptable risk: Indicates that people do not accept this level of risk and would not participate in the activity or permit others to participate.

75. (c)

The design strategy used to ensure reliability can fall between two broad extremes. The fail-safe approach is to identify the weak spot in the system or component and provide some way to monitor that weakness. When the weak link fails, it is replaced, just as the fuse in a household electrical system is replaced. At the other extreme is what can be termed "the one-horse shay" approach. The objective is to design all components to have equal life so the system will fall apart at the end of its useful lifetime just as the legendary one-horse shay did. Frequently an absolute worst-case approach is used; in it the worst combination of parameters is identified and the design is based on the premise that all can go wrong at the same time. This is a very conservative approach, and it often leads to overdesign.

76. (d)

There are many variations in detailed FMEA methodology, but they are all aimed at accomplishing three things:

(1) predicting what failures could occur;

(2) predicting the effect of the failure on the functioning of the system; and

(3) establishing steps that might be taken to prevent the failure, or its effect on the function.

77. (c)

Four basic costs are associated with quality.

- Prevention—those costs incurred in planning, implementing, and maintaining a quality system. Included are the extra expense in design and manufacturing to ensure the highest-quality product.
- Appraisal—costs incurred in determining the degree of conformance to the quality requirements. The cost of inspection is the major contributor.
- Internal failure—costs incurred when materials, parts, and components fail to meet the quality requirements for shipping to the customer. These parts are either scrapped or reworked.
- External failure—costs incurred when products fail to meet customer expectations. These result in warranty claims, loss of future business, or product liability suits.

78. (d)

Process capability is measured by the process capability index, Cp.

$$C_p = \frac{\text{Acceptable part variation}}{\text{Machine or process variation}}$$

$$= \frac{\text{Tolerance}}{\pm 3\hat{\sigma}} = \frac{USL - LSL}{3\hat{\sigma}(-35)}$$

$$= \frac{USL - LSL}{6\hat{\sigma}}$$

79. (c)

Six Sigma uses a disciplined five-stage process with the acronym DMAIC to guide improvement processes.

- **D**efine the Problem
- **M**easure
- **A**nalyze
- **I**mprove
- **C**ontrol

80. (c)

Robust design is the systematic approach to finding optimum values of design factors that lead to economical designs with low variability. The Taguchi method achieves this goal by first performing parameter design, and then, if the outcomes still are not optimum, by performing tolerance design.

Parameter design is the process of identifying the settings of the design parameters or process variables that reduce the sensitivity of the design to sources of variation. This is done in a two-step process. First, control factors are identified. These are design parameters that primarily affect the S/N ratio but not the mean. Using statistically planned experiments, we find the level of the control factors that minimize

the variability of the response. Second, once the variance has been reduced, the mean response can be adjusted by using a suitable design parameter, known as the signal factor.

81. (b)

ABC cost accounting is best used when there is diversity in the product mix of a company in terms of such factors as complexity, different maturity of products, production volume or batch sizes, and need for technical support. Computer-integrated manufacturing is a good example of a place where ABC can be applied because it has such high needs for technical support and such low direct labor costs. There is more work in using ABC than traditional cost accounting, but this is partly compensated by the use of computer technology to accumulate the cost data. A big advantage of ABC is that when the system is in place it points to those areas of indirect cost where large savings could be made. Thus, ABC is an important component of a

Total Quality Management (TQM) program aimed at process improvement and cost reduction.

82. (d)

83. (d)

Ergonomics involves such things as anthropometry, effects of stress, human performance in terms of physiology and mental functions, effects of stress upon performance, human error rates, human interaction with machines, especially the computer, tool design, workplace design, task design, control layouts. procedural enhancement, behavioral stereotypes, learning curve applications and temporarily handicapped worker accommodation

84. (b)

85. (a)

- Confined Space refers to any place, including any vessel, tank, container, pit, bund, chamber, cellar or any other similar space which, by virtue of its enclosed nature, creates conditions that give rise to a likelihood of an accident, harm or injury of such a nature as to require emergency action due to the presence or reasonable foreseeable presence of: flammable or explosive atmospheres, harmful gas, fume or vapour, free flowing solid or an increasing level of liquid, excess of oxygen, excessively high temperature the lack or reasonably foreseeable lack of oxygen

The key characteristics of a confined space are:

- the space must be substantially enclosed
- there must be a risk of at least one of the hazards listed above occurring within the space
- the risk of serious injury from the hazard must be created by virtue of the enclosed nature of the space
- the potential injury must be serious and be such as to require emergency action to rescue the person involved.

86. (a)

87. (d)

88. (a)

89. (a)

The epidemiological theory of accident causation- The key components are **predispositional characteristics** and **situational characteristics**. These characteristics, taken together, can either result in or prevent conditions that may result in an accident. For example, if an employee who is particularly susceptible to peer pressure (predispositional characteristic) is pressured by his coworkers (situational characteristic) to speed up his operation, the result will be an increased probability of an accident.

90. (d)

91. (c)

Occupational stress can affect your health when the stressors of the workplace exceed the employee's ability to have some control over their situation or to cope in other ways.

92. (c)

The purpose of the work site analysis program is to perform work site human factor related analysis and highlight stressors in the workplace. It also identifies the jobs that put workers at risk of developing CTDs. (cumulative trauma disorders).

93. (c)

A personal protection equipment is used to minimise the exposure of a worker in an unsafe and unhealthy environment, to several hazards.

94. (c)

Poor inspection of worker is related to quality factor and not related to causing degradation in work condition.

95. (a)

96. (b)

The imaginary plane by which the object is assumed to be cut is called the cutting plane or sectional plane. They may be perpendicular or parallel to one of the principle planes and either perpendicular or inclined to other planes. This planes are represented by their traces.

The lines used to represent the material which has been cut by the cutting plane are called section lines. They are also called hatchings or cross hatchings. There are equally spaced lines inclined at 45° to the horizontal.

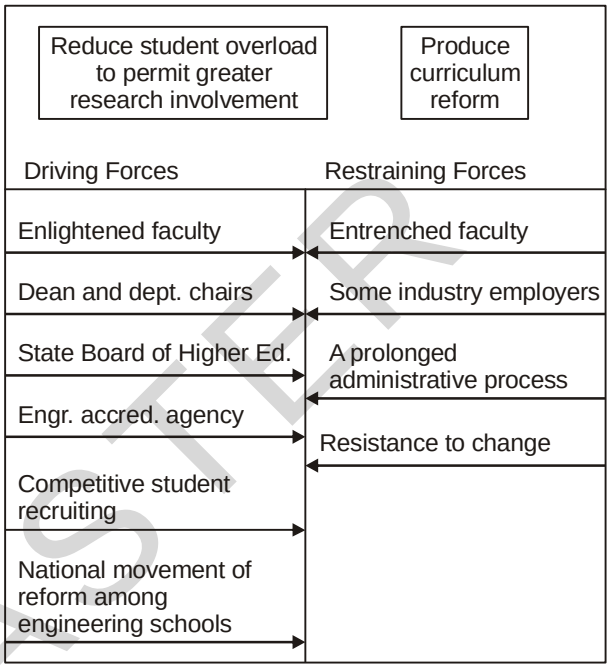
97. (a)

The information needed in design is different from that usually associated with an academic course. Textbooks and articles published in the scholarly technical journals usually are of lesser importance. The need often is for more specific and current information than is provided by those sources. Technical reports published as a result of government-sponsored R&D, company reports, trade journals, patents, catalogs, and handbooks and literature published by vendors and suppliers of material and equipment are important sources of information.

98. (d)

Force field analysis is a technique that identifies those forces that both help (drive) and hinder (restrain) the implementation of the solution of a problem. In effect, it is a chart of the pros and cons of a solution, and as such, it helps in developing strategies for implementation of the solution. It is used as a Problem solving tool while implementing in Solution Finding and Implementation phase.

(Below Figure) Force field diagram for implementing solutions to reducing student overload.



99. (d)

The objective of creative idea evaluation in design is not to winnow down the set of ideas into a single or very small number of solutions. The primary purpose of the refinement and evaluation step in concept generation is the identification of creative, feasible, yet still practical ideas. (convergent thinking dominates this process).

100.(b)

System safety is a specialty within **system** engineering that supports program risk management. It is the application of engineering and management principles, criteria and techniques to optimize **safety.**