DETAILED SOLUTIONS

MADE EASY

India's Best Institute for IES, GATE & PSUs

Test Centres: Delhi, Noida, Hyderabad, Bhopal, Jaipur, Lucknow, Bhubaneswar, Indore, Pune, Kolkata, Patna

ESE 2020 : Prelims Exam
CLASSROOM TEST SERIES

GENERAL STUDIES & ENGG. APTITUDE

Test 13

Section A : Standards and Quality Practices in Production, Construction, Maintenance & Services
Section B : Information and Communication Technologies (ICT)
Section C : Ethics and Values in Engineering Profession

1.	(b)	11.	(d)	21.	(a)	31.	(c)	41.	(d)
2.	(c)	12.	(c)	22.	(a)	32.	(d)	42.	(a)
3.	(a)	13.	(a)	23.	(c)	33.	(b)	43.	(c)
4.	(a)	14.	(a)	24.	(a)	34.	(b)	44.	(a)
5.	(c)	15.	(c)	25.	(b)	35.	(b)	45.	(c)
6.	(a)	16.	(d)	26.	(b)	36.	(d)	46.	(c)
7.	(c)	17.	(d)	27.	(c)	37.	(a)	47.	(d)
8.	(c)	18.	(c)	28.	(d)	38.	(a)	48.	(b)
9.	(c)	19.	(c)	29.	(a)	39.	(b)	49.	(b)
10.	(d)	20.	(a)	30.	(c)	40.	(d)	50.	(b)

DETAILED EXPLANATIONS

1. (b)

We know that,

$$\text{MTTF} = \frac{1}{\lambda}$$

(Where, λ is the failure rate and MTTF is mean time to failure)

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1}{1500} \text{ per min}$$

$$\Rightarrow \quad \lambda = \frac{60}{1500} = 0.04 \text{ per hr}$$

So, Reliability $R(t) = e^{-\lambda t}$

$= e^{-0.04t}$ (Where t, is in hour)

2. (c)

Liquid penetration testing – Surface

Ultrasonic testing – Volumetric.

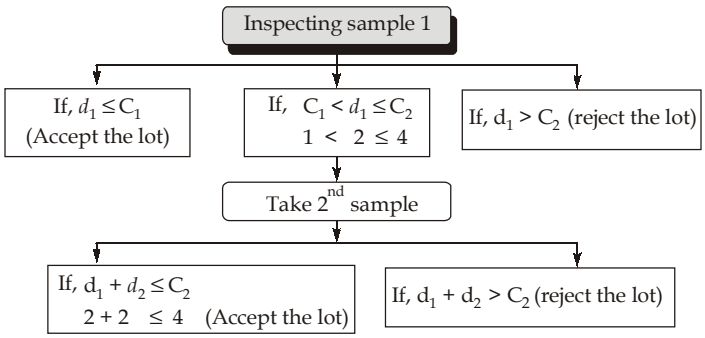
4. (a)

$N = 500, n_1 = 25, n_2 = 40, C_1 = 1, C_2 = 4$

As number of defective in first sample 'n_1' is 2 which is greater than C_1 i.e. 1. So, second sample $n_2 = 40$ is inspected and in this, the number of defective items is found 2.

Combining first and second samples of total size equal to 65, the total number of defective items are 4 which are less than or equal to C_2 i.e. 4, so lot will be accepted.

Alternative:



5. (c)

Process capability index = $C_p = \dfrac{USL - LSL}{6\sigma}$

6. (a)

The exciting quality curve lies entirely in the satisfaction region. This is the effect of innovation. Exciting quality represents *unexpected* quality items. The customer receives more than he or she expected. For example, Cadillac pioneered a system where the headlights stay on long enough for the owner to walk safely to the door.

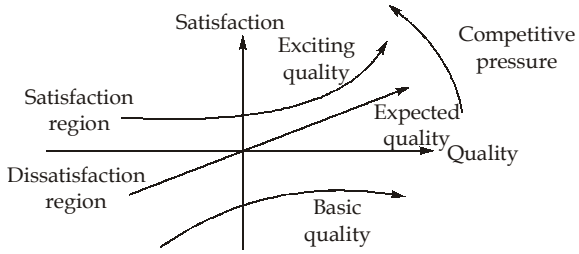


Fig.- Kano model showing relationship between customer satisfaction and quality levels.

7. (c)

Failure rate for combined system, $\lambda = \lambda_1 + \lambda_2 + \lambda_3$

$\lambda = 0.5 + 0.7 + 0.6$

$\lambda = 1.8$ per hour

9. (c)

Control chart for variables i.e. $\bar{x}$ and R chart

→ Follows normal distribution

Control chart for attributes i.e.

→ p-chart and np-chart follow Binomial distribution.

→ c-chart follows poisson's distribution.

10. (d)

According to the six sigma methodology, any process rarely stay centered. The center tends to shift above and below the target 'μ'. But if the process has shifted with in the range of 1.5σ above and 1.5σ below the target, 99.9996600% of the product output or service output characteristic will be between specifications and the non-conformance rate will be 3.4 DPMO.

11. (d)

$$\text{Central line, } \bar{c} = \frac{\Sigma c}{n} = \frac{20}{10} = 2$$

$$\text{LCL} = \bar{c} - 3\sqrt{\bar{c}} = 2 - 3 \times 1.414 = -2.24$$

As LCL (or defects) cannot be negative, so it should be zero.

12. (c)

Ordering cost, $C_0' = 1.25\ C_0$ (25% increase)

Holding cost, $C_h' = \frac{20}{100} \times C_h$ (decreases to 20%)

$= 0.2\ C_h$

$$EOQ' = \sqrt{\frac{2DC_0'}{C_h'}} = \sqrt{\frac{2D(1.25C_0)}{0.2C_h}}$$

$$= \sqrt{\frac{1.25}{0.2}} \times \sqrt{\frac{2DC_0}{C_h}}$$

$EOQ' = 2.5\ EOQ$

Hence, Economic Order Quantity increases by 150%.

13. (a)

Quality function deployment identifies the customer's expectations, the importance of those expectations that identifies the engineering characteristics which may be relevant to those expectations and then find a correlation between the two.

14. (a)

Number of breakdowns	Probability
0	2 / 20 = 0.1
1	8 / 20 = 0.4
2	6 / 20 = 0.3
3	4 / 20 = 0.2

Expected number of breakdown per month = Σ[Number of breakdown × Corresponding probability]

$= 0 \times 0.1 + 1 \times 0.4 + 2 \times 0.3 + 3 \times 0.2$

$= 0 + 0.4 + 0.6 + 0.6$

$= 1.6$ breakdowns/month

Expected breakdown cost = Expected number of breakdowns × Cost per breakdown

$= 1.6 \times 300$

= Rs. 480/month

15. (c)

TOM is a comprehensive management system which:

- Focuses on meeting the needs of the owners' or customers' by providing quality services at a cost that offers value to the owners/customers.
- Is driven by the quest for continuous improvement in all operations.
- Recognizes that everyone in the organization has internal or external owners or customers.
- Views an organization as an internal system with a common aim rather than as individual department acting to maximize their own performance.
- Focuses on the way of tasks that are accomplished rather than simply on what tasks are accomplished. Emphasizes on teamwork.

17. (d)

Prevention Costs:

1. Product/process design
2. Process control.
3. Burn-in.
4. Training
5. Quality data acquisition and analysis.

Appraisal Costs

1. Inspection and test of incoming material
2. Product inspection and test.
3. Material and services consumed.
4. Maintaining accuracy of test equipment.

18. (c)

Certain practices of management are labeled by Deming as deadly diseases or sins. These are
(i) management by visible figures only,
(ii) lack of constancy of purpose,
(iii)performance appraisal by numbers,
(iv)a short-term view of organization, and
(v) mobility of management.

19. (c)

- Benchmarking is not a substitute for innovation; however, it is a source of ideas from outside organization. Benchmarking forces an organization to set goals and objectives based on external reality. Consumers care about quality, cost and delivery, and not productivity of the organization.
- It is an improvement tool and must be used properly. Benchmarking isn't very helpful if it is used for processes that don't offer much opportunity for improvement

20. (a)

Internal customer is always defined within the organization/interlinked processes (e.g. marketing department may be an internal customer for production department).

22. (a)

Acceptance sampling was popularized by Dodge and Roming during world war II and originally applied by US millitary for the testing of bullets during world war II.

23. (c)

Some general reasons for lack of conspicuous success of TQM include: (i) lack of top down, high-level management commitment and involvement; (ii) inadequate use of statistical methods and insufficient recognition of variability reduction as a prime objective; (iii) diffuse as opposed to focused, specific objectives; and (iv) too much emphasis on widespread training as opposed to focused technical education and actual implementation.

24. (a)

The term "sigma" is used to designate the distribution or spread about the mean (average) of any process or procedure. For a process, the sigma capability (z-value, 6 in six sigma) is a metric that indicates how well that process is performing. The higher the z-value, capability will be better. Sigma capability measures the capability of the process to produce defect-free outputs. So in six sigma variability is less and quality is high.

25. (b)

Both statements are correct. But high conformance leads to product and services as the required standards which increases quality and decreases the failure cost.

26. (b)

An artificial neuron is known as a Perceptron.

27. (c)

The term "grid computing" denotes the connection of distributed computing, visualization, and storage resources to solve large-scale computing problems that otherwise could not be solved within the limited memory, computing power, or I/O capacity of a system or cluster at a single location.

28. (d)

The main limitations for the development of ICT in India are

1. High Hardware and Software Cost
2. Digital Divide
3. Language Diversity
4. Security

30. (c)

France-based European Information Technology Corporation 'Atos' and C-DAC (Centre For Development And Advanced Computing) of India have entered into agreement for designing, building and installing Supercomputer in India under NSM.

34. (b)

The user interface that allows users to interact with electronic devices through graphical icons and visual indicators such as secondary notation, instead of text-based user interfaces, typed command labels or text navigation is called as GUI or Graphical User Interface. The actions in a GUI are usually performed through direct manipulation of the graphical elements. Beyond computers, GUIs are used in many handheld mobile devices such as MP3 players, portable media players, gaming devices, smartphones and smaller household, office and industrial controls. The modern computers use GUI instead of CUI to perceived steep learning curve of command-line interfaces (CLIs)

37. (a)

Cloud Computing provides a platform for services which are referred to as "pay as you go" service thus it provides a better and efficient use of the resource as you don't have to buy or reserve the resource forever if you want to use it temporary.

38. (a)

Both machine language and assembly language are machine dependent language and thus are hardware dependent.

39. (b)

- Engineers are bound by law to mitigate risks involved in their design for projects.
- Warning for users is generally meant to give them information about how to handle the product safely and sometimes suggests measures to what precautions should be taken.

42. (a)

Some of the techniques for achieving collegiality are:
(i) Establishing/restoring a sense of professionalism
(ii) Vision
(iii) Defining expectations
(iv) Paying attention to structure
(v) Paying attention to gender and diversity issues
(vi) Compensation
(vii) Trust
(viii) Helpfulness
(ix) Balance of power
(x) Partner evaluations, etc.

43. (c)

Self-regarding virtues: Courage, temperance and perseverance.
Other-regarding or Altruistic virtues: Justice and benevolence.

44. (a)

Values that are pertinent to professional ethics include:
- Knowledge
- Diligence (careful and persistent effort)
- Honesty and truthfulness
- Confidentiality
- Honour
- Efficiency
- Loyalty
- Public health and safety

45. (c)

- Tragedy of Commons is a term developed by Garrett Hardin to discuss the decay of natural resources that are in public domain. It is related to environmental ethics.
- Micro-ethics is concerned with individuals and internal relations of the engineering profession, like health, safety, bribes, gifts, etc.
- Macro-ethics is concerned with the collective social responsibilities of the engineering profession, like sustainable development, product liability, etc.
- Ethical codes are component of professional ethics.

46. (c)
The term 'Double Dipping' refers to getting compensation twice for the same activity, typically in an illicit way. It is related to conflict of interest.

48. (b)
Engineers should enhance confidentiality of those information only which are required in ethical practice. An unethical information or practice must be conveyed to higher management or public.

49. (b)
Privileged information is available and accessed by virtue of a privilege, i.e., privilege of being employed on that assignment. The security check is also insisted during exit from the workplace against the leakage of such information.

50. (b)
Moral responsibility is not confined to the roles a person plays in a situation, rather it is based on obligations, norms and duties that arise from moral considerations. It can extend beyond the roles.

❍❍❍❍