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**Test Centres:** Delhi, Hyderabad, Bhopal, Jaipur, Pune, Kolkata**ESE 2025 : Prelims Exam | GS & ENGINEERING  
CLASSROOM TEST SERIES | APTITUDE****Test 13****Section A :** Standards & Quality practices in production, construction, maintenance & services**Section B :** Information and Communication Technologies**Section C :** Ethics and Values in Engineering Profession**ANSWER KEY**

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

## Section-A: Standards &amp; Quality Practices in Production, Construction, Maintenance &amp; Services

1. (b)  
If the defect is detected inside the production system it is termed as internal failure cost. It includes costs related to defective product before they are delivered to the customer like rework cost, material and product losses, scrap, breakdown etc.
2. (c)  
**External customer :** An external customer may be the one who uses the end product or service. An external customer exists outside the organization.  
**Internal customer :** Every function within organization whether it is engineering, order processing or production has an internal customer. That means each functional team is the customer of other functional team.
3. (c)  
According to Pareto principle 80% of the problem is caused by 20% of the causes. This is also known as 'Vital few and the trivial many'.
4. (c)  
**Kanban :**
  - It is a Japanese word which means card or sign.
  - The purpose of Kanban is to signal the need for more parts and to ensure that those parts are produced in appropriate time to support further assembly.
  - It is a physical control system consisting of card and container.**Kaizen :**
  - It is a system of continuous improvement in quality, technology, processes etc.
  - Kaizen is a system that involves every employee.
  - Kaizen is based on making little changes on a regular basis.
5. (c)  
Perceptual mapping is a diagrammatic technique used by asset marketers that attempts to visually display the perceptions of customers or potential customers. Typically the position of a company's product or brand is displayed relative to their competition.
6. (c)

$$AOQ = P_a \times P_d \left( \frac{N-n}{N} \right)$$

$N \rightarrow$  Lot size;  $n \rightarrow$  Sample size;  $P_a \rightarrow$  Probability of accepting the lot;  
 $P_d \rightarrow$  Fraction defect/Percentage defective

$$\begin{aligned} AOQ &= 0.4 \times 0.1 \left( \frac{10-1}{10} \right) = 0.4 \times 0.1 \times \frac{9}{10} \\ &= 0.4 \times 0.1 \times 0.9 = 0.036 \end{aligned}$$

7. (c)

$$y = k(x - T)^2$$

where,  $y$  = Taguchi's loss function;  $k$  = Taguchi's loss function constant

$x$  = Quality characteristic of interest;  $T$  = Nominal value;  $x - T$  = Tolerance value

$$100 = k(2)^2$$

$$k = \frac{100}{4} = 25$$

8. (b)

Elements of TQM:

1. Leadership
2. Leadership commitment
3. Recognition and award
4. Education and Training
5. Continuous quality improvement
6. Team work and employee empowerment
7. Feedback mechanism
8. Statistical process control

9. (c)

Sampling inspection is done so that a whole lot can be accepted or rejected by inspecting the sample taken from the lot. As the sample size increases, the number of defective items in the sample also increases which leads to a decrease in probability of acceptance of the lot.

10. (a)

ISO 9000 (Quality management)

ISO 14001 (Environmental management)

ISO 26000 (Social responsibility)

ISO 31000 (Risk management)

11. (a)

12. (a)

$$\begin{aligned} \text{DPMO} &= \frac{\text{Number of defects}}{[\text{No. of opportunities of error per unit}] \times [\text{No. of units}]} \times 10^6 \\ &= \frac{200}{5 \times 1000} \times 1000000 = 40000 \end{aligned}$$

13. (b)

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

Failure rate,  $\lambda = \frac{\text{Total number of failure}}{\text{Total cumulative observed time}}$

$$R(t) = e^{-\lambda(0)} = e^0$$

$$R(t) = 1$$

14. (a)

MTBF = Mean time between failure

MTTF = Mean time to failure

MTTR = Mean time to repair

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

Given  $R(t) = e^{-0.002t}$ 

$$\lambda = 0.002 \quad \dots(i)$$

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

$$\text{MTBF} = 500$$

$$\text{MTBF} = \text{MTTF} + \text{MTTR}$$

$$500 = \text{MTTF} + 50$$

$$\text{MTTF} = 450 \text{ hours}$$

15. (c)

Six sigma follows two project methodologies:

1. DMAIC
2. DMADV

DMAIC is a basic component of six sigma a way to improve work process by eliminating defects.

- Define
- Measure
- Analyze
- Improve
- Control

16. (d)

Factors affecting quality of construction are:

- Limitation of finance
- Limitation of labour and wage
- Limitation of rule and regulation
- Limitation of building plan and construction detail

17. (d)

Principles of lean construction :

- Eliminate waste
- Precisely specify value from the perspective of the ultimate customer.
- Make the value of adding steps flow without interruption by managing the interfaces between different steps.
- Let the customer pull-don't make anything until it is needed, then make it quickly.

18. (d)

UPV tests uses velocity of sound in solid material.

V is a function of square root of the ratio of its modulus of elasticity (E), to its density

$$V = f \left[ \frac{gE}{\rho} \right]^{1/2}$$

where,  $g$  = acceleration due to gravity,  $\rho$  = Density,  $E$  = Young's modulus

Application of UPV

1. Mean application for assessment of concrete uniformly.
2. To establish area of deteriorated concrete.
3. Detection of cracks.
4. Calculation of dynamic Young's modulus.

19. (d)

The methods given by some quality experts by which quality service can be improved are:

1. Taguchi method (Robustness)
2. Poka-Yoke (Fail-safing)
3. Quality function deployment
4. Quality in service package

20. (d)

Key factors contributing to GAPS :

GAP 1 → Not knowing what customers expect.

GAP 2 → The wrong service quality standards.

GAP 3 → Service performance gap.

GAP 4 → When promises do not match delivery.

GAP 5 → Discrepancy between customer expectation and their perception of the service received.

21. (d)

Juran Trilogy composed of three managerial processes :

1. **Quality planning** : To determine customer needs and develop processes and products required to meet and exceed those of customer needs.
2. **Quality control** : To ensure the process is running in optimal effectiveness.
3. **Quality improvement** : Eliminate waste, defects and rework that improve processes and reduces the cost of poor quality.

22. (c)

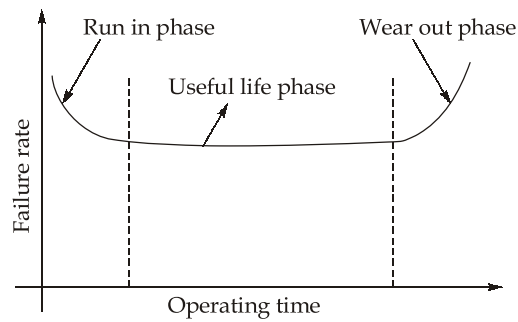
Quality control is necessary for both product based and service based organizations to minimize risk and maximize returns.

23. (c)

Quality circle is a group of workers who voluntarily meet to discuss way of improving products or process. Quality circles are less structured and more informal. The working staff involved in quality circles meet frequently either at someone's home or at the plant before shift begins.

24. (d)

During run in phase the failure rate is high owing to the presence of weak and substandard component. The failure rate is high but decreases gradually with time during this phase.



Bath tub curve

25. (c)
1. Brainstorming is one of the technique for generating a free flow of ideas to solve problem.
  2. It 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.
  3. People are able to think more freely and they suggest many spontaneous new ideas as possible.
  4. All the ideas are noted and are not criticized and after brainstorming session the ideas are evaluated.

### Section B : Information and Communication Technologies (ICT)

26. (a)
- The Wide Area Network (WAN) is a large computer network that connects groups of computers over large distances.
  - WANs are often used by large businesses to connect their office networks; each office typically has its own local area network, or LAN, and these LANs connect via a WAN.
27. (b)
- Phishing is a cybercrime in which a target or targets are contacted by e-mail, telephone or text message by someone posing as a legitimate institution to lure individuals into providing sensitive data such as personally identifiable information, banking and credit card details, and passwords.
28. (b)
- The usage of ICT enhance transparency, efficiency, and citizen participation, leading to better governance and improved service delivery. Thus, statements 1 and 2 are correct.
29. (b)
- A Switch operates at Layer 2 (Data Link Layer) of the OSI model and forwards data frames based on MAC (Media Access Control) addresses.
30. (c)
- Debugging is the process of detecting and errors (also called 'bugs') in a software code that can cause it to behave unexpectedly or crash.
31. (a)
- A router is a networking device typically used to interconnect LANs to form a wide area network.

32. (c)

A compiler is a computer program that translates code written in a high level language to a lower level language, object/machine code.

33. (c)

Peer-to-peer network refers to the exchange or sharing of information, data, or assets between parties without the involvement of a central authority. Bitcoin is built on a P2P network, where transactions are verified and recorded on a decentralized blockchain, allowing users to exchange Bitcoin directly without the need for a central intermediary. Thus, both the given statements are correct.

34. (c)

- The basic working principle of laser printing technology is an electro-photographic process. A laser beam is directed onto the drum surface, creating an electrostatic image of the content to be printed. The laser selectively discharges parts of the drum's surface, forming an invisible pattern of the desired text or images. This image is then transferred to a sheet of paper using a toner cartridge.
- Its printing speed and quality is better than those of other printers. Its printing speed ranges from 12 to 20 pages per minute. Thus, Laser printers are expensive than the inkjet printers because of their higher print volume capacity and print speed.
- Laser printers produce high-resolution prints with sharp text and graphics, while dot matrix printers use a matrix of pins to strike an inked ribbon, resulting in lower quality prints.

Hence, statements 1 and 3 are correct.

35. (b)

Magnetic tapes are characterized by sequential access to data and has slow access times and therefore, useful in real time or online applications.

36. (b)

37. (d)

- The uplink frequency is the frequency which is used for transmission of signals from earth station transmitter to the satellite. The downlink frequency is the frequency which is used for transmission of signals from the satellite to the earth station receiver.
- Frequency for uplink is generally kept higher than the downlink because the power at ground stations is more as compared to power available at satellites, allowing them to compensate for the increased attenuation that occurs at higher frequencies.

38. (b)

A gateway is a data communication device that provides a remote network with connectivity to a host network. It serve as the entry and exit point of a network; all data routed inward or outward must first pass through and communicate with the gateway in order to use routing paths.

**Section C: Ethics & Values in Engg. Profession**

39. (d)
40. (c)
41. (a)  
Arbitration provides an effective, expeditious resolution to technical disputes.
42. (c)
- Wisdom: Openness to the truth
  - Temperance: Quality of balance and self-control
  - Fortitude: Quality of courage and resilience
  - Justice: Equal treatment of all parties
43. (d)
44. (a)  
Collegiality is one of the necessary parts of performing duty, however, public welfare and safety are preceded in important criterion.
45. (c)
46. (c)
- Normative ethics is concerned with criteria of what is morally right and wrong.
  - Meta ethics is the study of moral thought and moral language. Rather than addressing questions about what practices are right and wrong, Meta ethics asks what morality actually is.
47. (c)
48. (a)
- Applied ethics refers to the practical application of moral considerations. It is ethics with respect to real-world actions and their moral considerations in the areas of private and public life, the professions, health, technology, law, and leadership.
  - Applied ethics is often referred to as a component study of the wider sub-discipline of ethics within the discipline of philosophy.
49. (b)
50. (c)

