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

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

1. (d)

2. (b)

Appraisal costs are the costs to determine conformance with quality standards. It include costs associated with inspection of materials, setup of test equipment, maintenance and calibration of test equipment.

3. (c)

- JIT is not able to handle dynamic situation.
- MRP can handle dynamic situation i.e. when demand changes suddenly.

4. (a)

- Process control makes use of "Control Charts".
- In product control, proper utilization of raw materials and auxiliaries has not been done.
- Product control does not provide any information about process time and production time.

5. (b)

- **Check sheet :** It is used to keep track of defects or make sources for people to collect data in correct manner.
- **Pareto analysis :** It approaches problem systematically, discovers the sources that may cause the majority of problems.
- **Control chart :** It is graph used to study how the process changes over time in which observations are plotted in the time order.
- **Histogram :** It is a type of bar chart that is used to represent statistical information by the way of bins to show the frequency distribution of continuous data.

6. (d)

Scatter plots consists of plotting data to depict the relationship between two variables and not fishbone diagram. Fishbone diagram is also called cause and effect diagram developed by Kaoru Ishikawa.

7. (a)

Here, $N = 100$, $n = 10$, $P_a = 0.6$, $P = 0.15$

$$\therefore \quad AOQ = P_a \cdot P\left(\frac{N-n}{N}\right)$$

$$= 0.6 \times 0.15 \times \left(\frac{100-10}{100}\right) = 0.081$$

8. (d)

9. (c)

$$\text{Tolerance} = 0.4$$

$$\text{Loss} = 0.5 \times 160 + 0.5 \times 0 = ₹80$$

According to Taguchi loss function,

$$L = k(y - y_0)^2$$

$$80 = k \times (0.4)^2 \qquad [\because \quad y - y_0 = 0.4]$$

$\therefore$ $k = ₹500$

10. (d)

- C – Chart : When number of defects per unit are counted.
- R – Chart : Shows the variation in the range of samples.
- $\overline{X}$ – Chart : Used to control the average quality of product.
- P – Chart : Used to monitor and control the fraction produced in a process that is defective or non-conforming.

11. (d)

- **Fixed order system:** Order size is fixed and time of order is not fixed.
- **Periodic review system:** Time of order is fixed and order size is not fixed.

12. (a)

TQM is a process-oriented approach as against the traditional result-oriented approach.

13. (c)

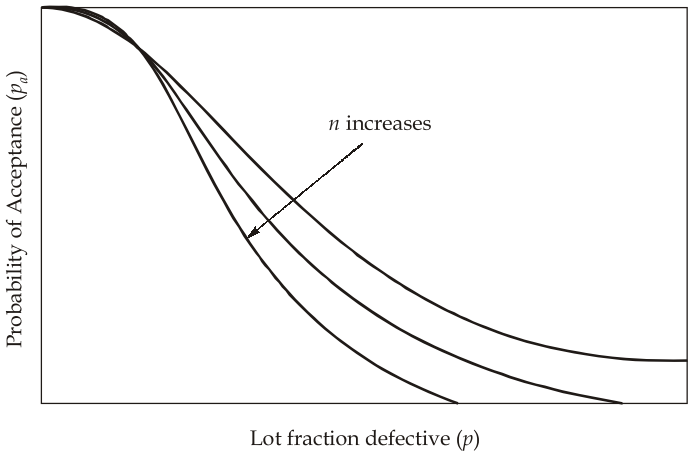
1. **Acceptance Quality Level:** It defines the percentage of defects at which consumers are willing to accept lots as 'good'. The producers would like to design a sampling plan such that there is high probability of accepting a lot that has a defect level less than or equal to the AQL.

   In other words we can say that "AQL is the worst tolerable quality level".

2. **Lot Tolerance Percent Defective or Rejectable Quality Level:** It defines the upper limit on the percentage of defects that a consumer is willing to accept. In other way, it is the poorest level of quality that the consumer is willing to tolerate in an independent lot. The probability of accepting a lot of RQL represents a risk for the consumer. As RQL is an unacceptable quality level, the probability of acceptance for on RQL should be low.
3. **Average Outgoing Quality (AOQ):** It represents the average percentage defectives in the outgoing products after inspection including all accepted and all rejected lots.

14. (b)

- **Effect of sample size *n* on OC curve:** As the sample size n increases the OC curve shape will become more steeper means tends to the ideal OC curve and it become more discriminating between good and bad lots.



15. (b)

Analyse : Analysis is extremely important to determine relationships and the factors of causality. Analyse the system to identify ways to eliminate the gap between the current performance of the system or process and the desired goal. Apply statistical tools to guide the analysis.

16. (c)

The reliability of the given system will be

$$R_S = 1 - (1 - R_1)(1 - R_2)(1 - R_3)$$

or

$$R_S = R_1 + R_2(1 - R_1) + R_3(1 - R_1)(1 - R_2)$$

17. (a)

18. (c)

19. (b)

In useful-life phase, only random failures occur which are unpredictable and cannot be prevented.

The following can be probable reason for failure in useful life phase:

1. Unexplainable cause
2. Human error
3. Low safety factor
4. High random stress than expected
5. Undetectable failure

20. (b)

Given : D = 900, C_0 = ₹100, C_h = ₹2/unit

$$\therefore \quad \text{EOQ} = \sqrt{\frac{2DC_0}{C_h}} = \sqrt{\frac{2 \times 900 \times 100}{2}} = 300$$

21. (b)

Kanban is scheduling system for just-in-time (JIT) production. Kanban is a system to control the logistical chain from a production point of view and is not an inventory control system. Kanban is one method through which (JIT) is achieved.

22. (c)

23. (b)

In predictive maintenance, we observe decrease in costs for parts and labour.

24. (c)

25. (a)

Section B : Information and Communication Technologies (ICT)

26. (d)

- The 'National Supercomputing Mission' (NSM) is steered by DST and MeitY, and implemented jointly by C-DAC and IISc.
- 'PARAM Shivay' was the first supercomputer assembled indigenously under the NSM. It was installed at IIT BHU.
- AIRAWAT is an AI supercomputer installed at C-DAC, Pune. It puts India on the global map for AI supercomputing (ranked in the top 500 globally).

27. (c)

- Network slicing is a key feature of 5G that allows operators to segment a single physical network into multiple virtual networks. to provide greater flexibility in the use and allocation of network resources.
- Each slice can be customized for specific needs (e.g., ultra-low latency for autonomous vehicles vs. massive bandwidth for streaming).

28. (c)

- **SaaS (Software as a Service):** User accesses software (e.g., Gmail, Office 365) via a browser; no management of underlying hardware or Operating System (OS).
- **PaaS (Platform as a Service):** User deploys apps created using provider tools.
- **IaaS (Infrastructure as a Service):** Provides on-demand access to users of computing resources such as servers, storage, network resources, etc.

29. (c)

- The National Quantum Mission (NQM) was approved in 2023. It targets developing quantum computers of 50-1000 qubits by 2030-31 in various platforms like superconducting and photonic technology. It is led by the Department of Science and Technology (DST).
- The mission focuses on the four mentioned thematic hubs (T-Hubs) : Quantum Computing, Quantum Communication, Quantum Sensing & Metrology and Quantum Materials & Devices.

30. (b)

According to Rule 9A of the Information Technology (Preservation and Retention of Information by Intermediaries providing Digital Locker facilities) Rules, 2016, documents available via DigiLocker are treated at par with original physical documents.

31. (b)

A "Zero Day" vulnerability refers to a security loophole/vulnerability in software that is unknown to the vendor. The attack occurs on "day zero" of awareness, meaning the developers have had zero days to fix it.

32. (b)

- Light Fidelity (Li-Fi) uses visible light (LED bulbs), not radio waves.
- The spectrum of visible light is much larger than radio waves, allowing for potentially higher data rates.
- Light cannot penetrate opaque walls, which provides better security but limits range compared to Wi-Fi.

33. (a)

PM-WANI (Prime Minister's Wi-Fi Access Network Interface) aims to proliferate Broadband through Public Wi-Fi networks. The PM-WANI framework envisages provision of Broadband through Public Wi-Fi Hotspot providers. It consist of elements such as Public Data Office (PDO), Public Data Office Aggregator (PDOA), App Provider and Central Registry.

34. (c)

The defining feature of public blockchain technology is that it is decentralized and does not rely on a central authority (like a bank or government) to validate transactions. Validation is done via consensus mechanisms (like Proof of Work or Proof of Stake) by the network participants.

35. (a)

CERT-In (Computer Emergency Response Team-India) is the national nodal agency for responding to computer security incidents as and when they occur. It operates under the Ministry of Electronics and Information Technology (MeitY).

36. (a)

Fiber optics use light signals (photons) rather than electrical signals (electrons). Because they are non-metallic, they do not suffer from electromagnetic interference, which degrades signal quality in copper wires over long distances. This immunity, combined with lower attenuation, makes them ideal for long-distance telecommunication backbones.

37. (c)

- P2P networks are decentralized; resources are shared among nodes (peers). If one peer goes down, others can still communicate with each other without the need for a central authority or server.
- P2P networks explicitly do not use a central server. Networks that use a central server are called Client-Server networks.

38. (a)

- IPv4 uses a 32-bit addressing scheme and supports approximately 4.3 billion addresses, which is insufficient for the explosion of connected devices (IoT, mobiles).
- IPv6 uses a 128-bit addressing scheme, providing a virtually infinite address space, thus solving the exhaustion problem.

Section C: Ethics & Values in Engg. Profession

39. (d)

- Values define our goals/purpose (e.g., happiness, peace), while skills (e.g., coding, management) are the tools to achieve them.
- Values vary by person/culture; skills are standardized techniques.
- A highly skilled hacker without ethical values is a threat to society. This is the core reason why engineering ethics is studied.

40. (b)

- Moral autonomy is the capacity to deliberate and arrive at moral decisions based on one's own reasoning rather than external authority.
- Blindly following custom is the opposite of autonomy; it is "heteronomy" or blind conformity.
- Like any other skill, moral reasoning improves with practice (case studies, debates).

41. (c)

42. (b)

43. (b)

- Virtue Ethics asks "What sort of person should I be?" rather than "What should I do?".
- Virtue is the balance. E.g., Courage is the mean between Cowardice (deficiency) and Rashness (excess).
- Aristotle argued that courage is not the absence of fear, but acting appropriately despite fear.

44. (b)

45. (d)

Professions (Engineering, Medicine, Law etc.) are characterized by intellectual labor, autonomy (independence), and judgment.

46. (b)

47. (c)

- Negligence does not require intent. If you were careless and caused harm, you are negligent, even if you didn't mean to hurt anyone. (Intent to harm would make it a criminal act/tort like battery or fraud).
- It is generally non-intentional (carelessness/omission).

48. (b)

- A Code of Ethics is a set of professional guidelines, not criminal law.
- Violating it might get you expelled from the professional society or lose your license, but the code itself doesn't put you in jail (unless the act was also a crime like fraud).
- These are the primary functions of a code.

49. (b)

50. (c)

Ethics refers as general and abstract concepts of right and wrong behavior culled from philosophy, theology, and professional societies.

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