





QUESTIONS WITH DETAILED SOLUTIONS

GENERAL STUDIES & ENGINEERING APTITUDE

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- 01. Ceramic raw materials are joined using a binder that doest not require firing or sintering in a process called
 - (a) Coating (b) Cementation
 - (c) Enamel (d) Slip casting

01. Ans: (b)

- **Sol:** Ceramic raw materials like powders or aggregates are joined together using a binders that hardens at room temperature, without the need for firing or sintering is called cold bonding. Cementation is one type of cold bonding GINEE
- 02. For many alloy systems at specific temperature, a maximum concentration of solute atoms that dissolve in the solvent to form a solid solution is
 - (a) Equilibrium of alloy
 - (b) Free energy
 - (c) System
 - (d) Solubility limit

02. Ans: (d)

- **Sol:** Solubility limit: The maximum concentration of solute atoms that can dissolve in the solvent to form a solid solution at specific temperature.
- 03. The long chain molecules are randomly oriented in(a) Plastic(b) Metal(c) Diamond(d) Coal

03. Ans: (a)

Sol: Plastics are made of long-chain polymer molecules. In amorphous plastics, there chains are randomly oriented

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- 04. In which one of the following dislocations, an extra portion of a plane of atoms or half plane, the edge of which terminates within the crystal?
 - (a) Screw dislocation
 - (b) Edge dislocation
 - (c) Mixed dislocation
 - (d) Burgers dislocation

04. Ans: (b)

Sol: An edge dislocation occurs when an extra half plane of atoms are terminated within the crystal.

In edge dislocation, the dislocated atoms are moving parallel to the applied force.

05. The bond that is formed between water molecules due to attraction between the positively-charged hydrogen end of a molecule and the negativelycharged oxygen end of another molecule is called (a) Hydrogen bond (b) Covalent bond (c) Ionic bond (d) Metallic bond

05. Ans: (a)

Sol: In water (H₂O), the hydrogen atom carries a partial positive charge, and the oxygen atom carries a partial negative charge.

The attraction between the hydrogen of one water molecule and the oxygen of another is called a hydrogen bond.

- 06. The capacity of a material to absorb energy when it is deformed elastically and then, upon unloading, to have this energy recovered is called
 - (a) Toughness
 - (b) Resilience
 - (c) Modulus of elasticity
 - (d) Yielding



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06. Ans: (b)

Sol: Resilience: It is the ability of material that can absorb energy within elastic limit

Resilience is measured by area of $\sigma - \in$ curve within elastic limit.



- 07. A specimen of steel having an original diameter of 12.8 mm is tensile tested to fracture and found to have engineering fracture strength σ_f of 460 MPa. If its cross sectional diameter at fracture is 10.7 mm, the ductility in terms of percent reduction in area will be
 - (a) 25 % (b) 30 % (c) 35 % (d) 40 %

07. Ans: (b)

Sol: Initial diameter = $d_i = 12.8 \text{ mm}$ Final diameter = $d_f = 10.7 \text{mm}$ Ductility = % reduction in area = $\frac{A_i - A_f}{A_i} \times 100$

$$\left(1 - \frac{A_{\rm f}}{A_{\rm i}}\right) \times 100 = \left(1 - \left(\frac{d_{\rm f}}{d_{\rm i}}\right)^2\right) \times 100$$

= $\left(1 - \left(\frac{10.7}{12.8}\right)^2\right) \times 100 = 30.12\%$

- 08. External companies are enabled to view some of a particular company's information and such sharing of information is known as
 - (a) Ethernet
 - (c) Extranet
- (b) Internet(d) Fibrenet

08. Ans: (c)

- **Sol:** An extranet is a private network that allows a company to securely share information with external partners like suppliers, customers, or vendors. It's a controlled extension of an internal network. Access to an extranet is restricted and granted only to authorized individuals.
- 09. A system or group of systems that enforces an access control policy between a trusted network and an untrusted network is called
 - (a) Perimeter access control
 - (b) Intrusion monitoring
 - (c) Interfacing the hardware components
 - (d) Managing the network privately

09. Ans: (a)

- Sol: Perimeter access control refers to the security measures put in place to monitor and control traffic at the boundary (or perimeter) between a trusted network (like a company's internal network) and an untrusted network (like the internet). This typically includes firewalls and other systems designed to
 199 enforce access control policies, allowing or denying data packets based on predetermined rules.
 - 10. Which one of the following is the correct sequence of e-Governance evolution model?
 - (a) Information, Transaction, Transformation and Interaction
 - (b) Information, Transaction, Interaction and Transformation
 - (c) Information, Transformation, Transaction and Interaction
 - (d) Information , Interaction, Transaction and Transformation



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10. Ans: (d)

- Sol: This sequence represents the e-Governance Maturity Model, which outlines the typical stages in the evolution of digital government services:
 - 1. Information Government provides basic information online (e.g., forms, policies).
 - 2. Interaction Users can interact with government

agencies online (e.g., email, downloadable forms).

- 3. Transaction-Citizens can complete transactions online (e.g., paying taxes, renewing licenses).
- 4. Transformation Full integration and reengineering of government processes to deliver seamless, user-centered services.
- 11. Which one of the following phases is predominantly a testing and final standardization effort so that operations can begin in project management?
 - (a) Conceptual phase
 - (b) Production phase (d) Evaluation phase (c) Operational phase

11. Ans: (d)

Sol: Project management phases:



Validation & verification must be done before operations / commissioning

(b) Independent float

- 12. Which one of the following float of an activity is the spare time available for that activity, if that activity is started as late as possible and is finished as early as possible?
 - (a) Total float
 - (c) Free float (d) Slack

12. Ans: (b)

Sol: Independent float (IF) = $E_i - L_i - d_{ii}$



Where $L_i =$ latest start time $E_j = Early$ completion time

- 13. If the nominal rate of interest is 12% and is compounded quarterly, the effective rate of interest will be
 - (a) 10.6 % per annum
 - (b) 12.6 % per annum
 - (c) 14.4 % per annum
 - (d) 16.4 % per annum

13. Ans: (b)

Sol: compounded quarterly, $\Rightarrow c = 4$

Effective interest rate $(i_{eft}) = (1 + \frac{i}{c})^c - 1$

$$=\left(1+\frac{0.12}{4}\right)^4-1$$

= 0.125 (or) 12.5%



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- 14. Which one of the following approaches is available to estimate the rate of returns required by the equity share holder?
 - (a) Dividend growth approach
 - (b) Divided reinvestment approach
 - (c) Dividend capitalization approach
 - (d) Dividend pricing model approach

14. Ans: (a)

Sol: Dividend growth model: It evaluates the stock value without considering the brand image or customer loyalty and market conditions

Dividend Re-investment plan (DRIP):

the investors re-invest their dividends into additional shares of the same company

Dividend capitalization approach:

It is used to find out the present value of future dividend payments

Dividend pricing model:

It is a method to estimate the intrinsic value of a company's stock.

- 15. An assessment of comparative strength and weakness of a business firm in relation of competitions on one hand and the environmental opportunities and threats which a firm may be exposed to face is carried through
 - (a) Time-series analysis
 - (b) Cost-benefit analysis
 - (c) SWOT analysis
 - (d) Profit analysis

15. Ans: (c)

- Sol: SWOT Analysis
 - S: strengths W: weaknesses O: opportunities T: threats

- 16. Which of the following is not considered as fundamental dimension of project plans?(a) Time(b) Cost
 - (c) Scope (d) Quality

16. Ans: (d)





- 17. The shadow price of a unit of foreign exchange is (a) $\sum_{i=1}^{n} F_i Q_i P_i$ (b) $\sum_{i=1}^{n} F_i + Q_i + P_i$
 - (c) $\sum_{i=1}^{n} F_i + Q_i P_i$ (d) $\sum_{i=1}^{n} F_i Q_i + P_i$ where:
 - P_i is domestic market clearing price of a commodity i Q_i is quantity of commodity i bought with one unit foreign exchange

 F_i is fraction of foreign exchange, at margin spent on importing commodity

17. Ans: (a)

Sol: A shadow price is the true economic value of a resource not reflected in market prices often used in government planning, development economics, and cost-benefit analysis.

What is the Shadow Price of Foreign Exchange? The shadow price of a unit of foreign exchange is the true opportunity cost of spending one unit of



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foreign currency (like \$1) for importing goods. In other words:

What is the domestic value (in terms of benefits or costs) we get by using 1 unit of foreign exchange? This is crucial for developing economies, where:

- Foreign exchange is scarce
- It is allocated by the government to prioritized sectors
- Market exchange rate may not reflect the true social cost/benefit

If:

- F_i = fraction of foreign exchange spent on commodity i
- Q_i = quantity of commodity i bought with 1 unit of foreign exchange
- P_i = domestic price of commodity i

Then the shadow price of 1 unit of foreign exchange is:

Shadow Price = $\sum_{i=1}^{n} F_i \times Q_i \times P_i$

18. An Income Elasticity of Demand e, is

(a)
$$\frac{Q_2 - Q_1}{I_2 - I_1} \times \frac{I_2 + I_1}{Q_2 + Q_1}$$
 (b) $\frac{Q_2 + Q_1}{I_2 - I_1} \times \frac{I_2 + I_1}{Q_2 + Q_1}$
(c) $\frac{Q_2 - Q_1}{I_2 + I_1} \times \frac{I_2 - I_1}{Q_2 + Q_1}$ (d) $\frac{Q_2 - Q_1}{I_2 + I_1} \times \frac{I_2 + I_1}{Q_2 + Q_1}$

where:

 Q_1 is quantity demanded in the base year

- Q_2 is quantity demanded in the following year
- I₁ is income level in the base year
- I₂ is income level in the following year

18. Ans: (a)

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Sol: Income Elasticity of Demand (e_i) measures how much the quantity demanded of a good changes in response to a change in consumer income.

Formula:

There are two ways to write it:

1. Basic Percentage Change Formula:

 $e_{i} = \frac{\% \text{ change in quantity demanded}}{\% \text{ change in income}} = \frac{\Delta Q/Q}{\Delta I/I}$

2. Midpoint (Arc Elasticity) Formula (more accurate):

$$\mathbf{e}_{i} = \frac{\mathbf{Q}_{2} - \mathbf{Q}_{1}}{\mathbf{I}_{2} - \mathbf{I}_{1}} \times \frac{\mathbf{I}_{1} + \mathbf{I}_{2}}{\mathbf{Q}_{1} + \mathbf{Q}_{2}}$$

Where:

 Q_1, Q_2 : Quantity demanded in base and new year I₁, I₂: Income levels in base and new year Interpretation of ea

Value of e _i	Interpretation	Type of Good
>1	Demand increases more than income	Luxury Good
=1	Demand increases pro- portionally	Normal Good
< 1 but > 0	Demand increases less	Necessity
	than income	Good
= 0	Demand unaffected by	Essential Good
	Income	
< 0	Demand falls as in-	Inferior Good
	come rises	

- 19. Consider the following data: Atomic radius of copper = 1.278 \AA , $A_w = 63.54, N_a = 4, N_a = 6.023 \times 10^{23}$ The density of the copper will be nearly (a) 9 gram/cm³ (b) 7 gram/cm³ (d) 3 gram/cm^3
 - (c) 5 gram/cm³



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19. Ans: (a)

Sol: $R_{cu} = 1.278 A^{\circ} = 1.278 \times 10^{-8} cm$ Lattice constant $= a = \frac{4R}{\sqrt{2}} = 3.612 \times 10^{-8} cm$

> Volume of unitcell = $V_{vc} = a_3 = (3.612 \times 10_{-8})_3$ = 4.71 × 10⁻²³ cm³

Theoretical density = $\rho_{cm} = \frac{n \times AW}{AN \times V_{vc}}$

 $\frac{= 4 \times 63.54}{6.23 \times 10^{23} \times 4.71 \times 10^{-23}} = 9 \text{ gram/cm}^3$

- 20. The Knoop's Hardness Number (KHN) is
 - (a) $\frac{PC}{L^2}$
 - (c) $\frac{P+C}{L^2}$ where:

L is the length of the long diagonal

C is the constant related to the length of projected area for each indenter

(b) $\frac{P}{L^2C}$

(d) $\frac{P}{L^2 - C}$

P is the applied load

20. Ans: (b)

Sol: Knoop's Hardness number (KHN) = $\frac{P}{L^2_{c}C}$

L = Length of the cong diagonal of the indensation

- C = Constant
- P = applied load
- 21. Which one of the following attack methods is originally developed as a rapid method to conduct many different IP-based DoS attacks?
 - (a) Nestea (b) Packet storms
 - (c) Teadrop (d) Targa

21. Ans: (d)

Sol: Targa is a tool that was originally developed to

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perform multiple IP-based Denial of Service (DoS) attacks quickly and easily. It supports a variety of attack techniques, making it a versatile DoS tool.

- 22. A special server-side programs that acts between the Hyper Text Transfer Protocal HTTP server and other local resources such as databases is
 - (a) HTML programs
 - (b) JavaScript programs
 - (c) Gateway programs
 - (d) High Level programs

22. Ans: (c)

- **Sol:** A gateway program acts as a bridge between the HTTP server and other local resources like databases. When a web server receives a request for dynamic content (content that needs to be generated on the fly), it invokes the gateway program. This program then interacts with the database or other backend systems to retrieve the necessary data and send it back to the server to be served to the client's browser.
- 23. Which of the following log files records failed logins in UNIX Operating System?
 - (a) Aculog(b) Xferlog(c) Loginlog(d) Syslog

23. Ans: (c)

- **Sol:** In UNIX-based systems, the failed login attempts are often logged in a Loginlog file. This log specifically keeps track of user login activities, including both successful and failed login attempts. Here's why the other options are not correct:
 - (a) Aculog This is not a standard log file in most UNIX systems. It may be used by some specific



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applications or systems, but it's not related to failed logins.

- (b) Xferlog This log file is used by FTP servers to log file transfer activities, not login attempts
- (d) Syslog While syslog does capture many types of system events (including some authentication-related events), failed login attempts are typically captured in loginlog (or similar authentication-specific logs like auth.log).
- 24. What is the time to perform search, insert, and delete operations in the average case as well as the worst case by using AVL tree?

(a) O(n)(b) $O(\log n)$ (c) $O(n^2)$ (d) $O(n \log n)$

24. Ans: (b)

- Sol: AVL trees are self-balancing binary search trees, which means they maintain a balanced structure by performing rotations when necessary to ensure that the height of any subtree is at most one greater than the height of its sibling subtree. This balancing property guarantees that search, insert, and delete operations take O(log n) time in both average and worst cases.
- 25. Which one of the following digital investigation models is based on the 'Zachman Framework' and was created to assist with the design, development and management of enterprise IT architecture?
 - (a) Physical model
 - (c) FORZA model
- (b) Staircase model

(d) Sub-phase model

25. Ans: (c)

Sol: The FORZA model is based on the Zachman

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Framework and was developed to help with the design, development, and management of enterprise IT architecture. It focuses on providing a structured approach to digital forensics investigations by aligning with the concepts from the Zachman Framework, which is a popular framework for organizing and classifying the components of an enterprise's IT architecture.

- 26. An equivocal forensic analysis is one in which the conclusions regarding the physical and digital evidence are
 - (a) End of interpretation
 - (b) Still open to interpretation
 - (c) Reconstruction of interpretation
 - (d) Reformation of interpretation

26. Ans: (b)

- **Sol:** An equivocal forensic analysis refers to a situation where the conclusions drawn from the physical and digital evidence are ambiguous or uncertain. This means the evidence does not provide a clear, definitive answer, and there is still room for different interpretations or conclusions. 99
- 27. Cross-site scripting is a general set of techniques whereby an attacker is able to
 - (a) Send the mass e-mails to the recipients
 - (b) Host a website on an infected or malicious web server
 - (c) Execute a malicious code on another system through an intermediary web application
 - (d) Control on the web application through SQL control characters

27. Ans: (c)

Sol: Cross-site scripting (XSS) is a vulnerability that



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allows attackers to inject malicious code into a legitimate website, which is then executed by the user's browser when they visit the site, effectively allowing them to run code on the victim's system through the intermediary web application.

- 28. An idea, a design, a manuscript, an invention, or a concept which will give rise to a useful product/ application, is known as
 - (a) Intellectual property right
 - (b) Employees right
 - (c) Professional right
 - (d) Recognition right

28. Ans: (a)

Sol: An idea, a design, a manuscript, an invention, or a concept which will give rise to a useful product or application is known as: Intellectual Property (IP) It can fall under different categories of intellectual property rights (IPR):

Patent – for inventions and technical innovations Copyright – for original literary or artistic works (e.g., manuscripts, software)

Design – for the aesthetic or ornamental aspects of a product

Trademark – for brand names, logos, and symbols Trade Secret – for confidential business information or formulas.

- 29. An engineering ethics is the study of
 - (a) Decisions, policies and values that are morally desirable in engineering practice and research
 - (b) Policies, time-management and values that are morally desirable in engineering practice and research
 - (c) Decisions, time-management and values that

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are morally desirable in engineering practice and research

(d) Policies, human resource management and values that are morally desirable in engineering practice and research

29. Ans: (a)

Sol: Engineering Ethics is primarily concerned with:

- Moral decisions made by engineers,
- Ethical policies followed in engineering practices,
- Core values such as honesty, integrity, fairness, and respect for human life.

It is not about time management or HR practices specifically, though those may be influenced by ethical considerations.

- 30. Manufacturing, selling or transporting products (liquor and narcotics) that are prohibited by law, is called
 - (a) Industrial espionage
 - (b) White-collared crimes
 - (c) Bootlegging
- (d) Glitching

30. Ans: (c)

- Sol: Bootlegging refers to the illegal manufacturing, selling, or transporting of products (typically liquor or narcotics) that are prohibited by law.
- 31. Microorganisms which can produce organic matter to some extent through oxidation of certain chemicals in the absence of sunlight are known as (a) Photo-autotrophs (b) Chemo-autotrophs
 - (c) Micro-autotrophs
- (d) Oxi-autotrophs



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31. Ans: (b)

- **Sol:** Chemo-autotrophs are microorganisms that can produce organic matter through the process of chemosynthesis. They oxidize certain chemicals (like hydrogen sulfide, methane, or ammonia) to obtain energy, and they use carbon dioxide as a carbon source to produce organic compounds. This process occurs in the absence of sunlight.
- 32. The downstream concentration CI in a mathematical model of simple water quality mixing with respect to EIA methodologies is

 $\frac{\mathbf{C}_{\mathrm{o}} - \mathbf{Q}_{\mathrm{e}} \mathbf{C}_{\mathrm{e}}}{\mathbf{Q}_{\mathrm{o}} + \mathbf{Q}_{\mathrm{e}}}$

 $\frac{C_{o} - Q_{e}C_{e}}{O_{o} - O_{o}}$

(a)
$$\frac{Q_{o}C_{o} + Q_{e}C_{e}}{Q_{o} + Q_{e}}$$
 (b)
$$\frac{Q_{o}}{Q_{o}}$$

(c)
$$\frac{Q_{o}C_{o} + Q_{e}C_{e}}{Q_{o} - Q_{e}}$$
 (d)
$$\frac{Q_{o}}{Q_{o}}$$

where:

- Q_e is the effluent flow
- Q_0 is the upstream flow
- C_e is the effluent concentration
- C_{o} is the upstream concentration

32. Ans: (a)

Sol: To determine the downstream concentration CI in a simple water quality mixing model (used in Environmental Impact Assessment - EIA), we apply the mass balance equation:

 $C_{I} = \frac{Q_{o}C_{o} + Q_{e}C_{e}}{Q_{o} + Q_{e}}$ Where:

- Q₀: Flow rate of the original (main) stream
- Co: Concentration of pollutant in the original stream
- Q_e: Flow rate of the effluent (added stream)
- C_c: Concentration of pollutant in the effluent

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- C₁: Resultant (downstream) concentration after mixing
- This equation simply accounts for the total mass of pollutant divided by the total flow.

(d) $\frac{3}{8}\rho\pi D^2 V^3$

33. The available wind power P_a in an aero-turbine is

(a)
$$\frac{1}{8}\rho\pi D^2 V^3$$
 (b) $\frac{3}{8}\rho\pi D^3 V^2$

(c) $\frac{1}{8}\rho\pi D^{3}V^{2}$ where:

V is the velocity of air D is the diameter of circular flow ρ is the density of air

33. Ans: (a)

Sol: Wind Energy
$$=\frac{1}{2}\rho AV^3$$

$$= \frac{1}{2}\rho \times \frac{\pi}{4}D^2V$$
$$= \frac{1}{8}\rho\pi D^2V^3$$

- 34. 'Algal Bloom' is, when unusually large concentrations of
 - (a) Nutrients are present in water bodies; an excess growth of algae appears
 - (b) Planktons are present in water bodies; an excess growth of algae appears
 - (c) Bacteria are present in water bodies; an excess growth of algae appears
 - (d) Oxygen is present in water bodies; an excess growth of algae appears

34. Ans: (a)

Sol: An algal bloom occurs when there is an excess of nutrients, particularly nitrogen and phosphorus, in water bodies. These nutrients often come from agricultural runoff, sewage, and industrial waste.



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The abundance of nutrients fuels the rapid growth of algae, which can form large, visible blooms.

- 35. The correct sequence of the components of biological diversity or biodiversity in the hierarchy of eco-system is
 - (a) Landscape, Population, Species, Community and Gene
 - (b) Community, Landscape, Population, Species and Gene
 - (c) Landscape, Community, Population, Species and Gene
 - (d) Community, Population, Land- scape, Species and Gene

35. Ans: (c)

- **Sol:** The hierarchy of biological diversity or biodiversity typically follows a sequence that starts from the larger, broader levels and moves to the smaller, more specific levels. Here's the correct order:
 - 1. Landscape: This is the largest level, which includes various ecosystems and habitats spread across a large area.
 - 2. **Community:** A community consists of different oppulations of species living in the same area and interacting with each other.
 - 3. **Population:** A population refers to a group of individuals of the same species living in a specific area.
 - 4. **Species:** Species are groups of individuals that can interbreed and produce fertile offspring
 - 5. Gene: The genetic diversity within a species or population, focusing on the genetic variation within individuals.



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36. The geometrical shape or form of the smoke coming out of a chimney is called(a) Fume (b) Fog (c) Plume (d) Smog

36. Ans: (c)

- Sol: The geometrical shape or form of smoke coming out of a chimney or stack is referred to as a plume. A plume is a visible mass of smoke, gas, or vapor rising and spreading out from a source, such as a chimney, smokestack, or fire. Let's break down the other options:
 - Fumes are usually small, fine particles or gases, often harmful, released during chemical processes. This term doesn't describe the shape of the smoke.
 - Fog is a collection of tiny water droplets suspended in the air, reducing visibility. It's not related to smoke or the shape of smoke
 - Smog is a combination of smoke and fog, typically resulting from air pollution, and it is not the shape of smoke coming from a chimney.
- 37. A situation when there is a prolonged period of inadequate rain fall, marked with erratic distribution of the same over time and space, is called
 - of the same over time and space, is calle
 - (a) Agricultural drought(b) Ecological drought

 - (c) Hydrological drought
 - (d) Meteorological drought

37. Ans: (d)

Sol: A meteorological drought refers to a period of significantly less rainfall than normal in a given area, characterized by uneven distribution over time and space. This is the initial stage of drought, where the lack of precipitation directly impacts the weather patterns.



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- 38. The process of converting the solid wastes-sewage sludge, domestic and agricultural wastes into compost manure is called
 - (a) Sericulture
- (b) Ployculture
- (c) Bio-digester (d) Vermiculture

38. Ans: (d)

Sol: Vermiculture is the process of using earthworms to convert organic waste (like sewage sludge, kitchen waste, agricultural waste) into nutrient-rich compost known as vermicompost. It's a sustainable method of waste management and soil enrichment.

Other Options (Incorrect):

- (a) Sericulture Rearing of silkworms for silk production.
- (b) Polyculture Practice of growing multiple crops or organisms in the same space.
- (c) Bio-digester A system that anaerobically decomposes organic waste to produce biogas and slurry, but it's not specifically for compost manure in the way vermiculture is.
- 39. A mass movement in which material moves along a curved surface of rupture (slow or moderately rapid movement of a coherent body of rock) is called

(d) Earth creep

- (a) Soil creep (b) Slump
- (c) Rockslide

39. Ans: (b)

Sol: A slump is a type of mass movement where a coherent body of rock or soil moves along a curved surface of rupture. This movement can be slow to moderate in speed, and the material typically stays somewhat intact as it moves down a slope.

Here's why the other options aren't correct:

(a) Soil creep: This refers to the very slow, gradual

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downward movement of soil and other debris due to gravity, but it is not characterized by movement along a curved surface.

- (c) **Rockslide:** A rockslide occurs when a mass of rock rapidly moves down a slope along a straight surface. It is much more rapid and typically involves rock rather than soil.
- (d) **Earth creep:** This is another term for soil creep, referring to slow, gradual downslope movement of material under the influence of gravity, but it doesn't involve a curved surface of rupture.
- 40. A layout which is designed in such a way that the entire process of receiving raw materials, processing and the outward movement of the finished goods takes place smoothly and efficiently is called
 - (a) Transport layout
 - (b) Organizational layout
 - (c) General functional layout
 - (d) Utilities layout

40. Ans: (a)

- **Sol:** A Transport layout is specifically designed to ensure smooth and efficient flow of materials from receiving raw materials, through processing, to the dispatch of finished goods. The primary goal is to minimize handling, delays, and transportation costs, improving the overall efficiency of the production or distribution process.
- 41. Moral statements are merely used to express emotions and to try to influence other people's behaviour but they are not supportable by valid moral reasons. This is termed as

(a) Nihilism	(b) Compatibilism
(c) Emotivism	(d) Eudaimonia



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41. Ans: (c)

- **Sol:** Emotivism is a meta-ethical view that holds moral statements that do not express objective facts or truths but instead convey the speaker's emotions, such as approval or disapproval, and are primarily used to influence the attitudes or behavior of others. without being supported by rational or moral reasoning.
- 42. In order to ensure the confluence of good engineering, good business, and good ethics, it is essential for engineering and corporations, in their major dimensions, to be
 - (a) Socially aligned
 - (b) Spiritually aligned
 - (c) Morally aligned
 - (d) Conscientiously aligned

42. Ans: (c)

- Sol: Morality is directly concerned with principles of right and wrong, which is the essence of ethics. For good engineering, good business, and good ethics to align, the underlying principles must be moral. This option directly addresses the "good ethics" component mentioned in the question.
- 43. What is Teleological Approach?
 - individual personnel (a) Developing an characteristics
 - (b) We can know what is good only when we have fully understood the context
 - (c) Judging whether an action is right, fair and honest
 - (d) Placing posters about ethics throughout the organization

43. Ans: (b)

- Sol: The Teleological Approach is a consequentialist ethical theory. It judges the morality of an action based on its outcomes or consequences. According to this view, an action is right if it leads to a desirable or beneficial outcome. It emphasizes understanding the context and results to determine what is good.
- 44. Self-respect, family happiness, comfortable life, professional growth and recognition are
 - (a) Terminal values
 - (b) Instrumental values
 - (c) Mainstream values
 - (d) Human values

44. Ans: (a)

- Sol: These are desirable end-states of existence; the goals that a person strives to achieve in life. They represent the ultimate goals or aspirations that an individual has. Examples often include happiness, security, wisdom, freedom, true friendship, a comfortable life, family happiness, and self-respect.
- Yawning, sneezing, relaxing the body by bending 45. backwards, backwards, snoring, spitting, such habits are to be avoided in front of others in a gathering. A person who is conscious of above habits is said to have
 - (a) Ethics (b) Values (d) Civic sense (c) Integrity

45. Ans: (d)

Sol: Civic sense refers to the sense of responsibility and awareness of one's surroundings and public behavior. It involves showing respect for others, maintaining cleanliness, and generally behaving in



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Questions with detailed solutions

a way that contributes positively to public life and

social harmony. Avoiding disruptive or impolite habits in public or in a gathering falls directly under the umbrella of civic sense or good manners.

- 46. A balance between good and bad consequences of an action, taking into account the consequences for everyone affected is known as
 - (a) Virtue ethics
 - (c) Duty ethics

(b) Utilitarianism

(d) Right ethics

46. Ans: (b)

- Sol: Utilitarianism is an ethical theory that focuses on balancing the good and bad consequences of an action to maximize overall happiness or well-being for everyone affected. It evaluates actions based on their outcomes
- 47. Ethics that guides human conduct and sets out certain moral standard is called
 - (a) Metaethics
- (b) Applied ethics
- (c) Normative ethics
- (d) Legal ethics

47. Ans: (c)

Sol: Normative Ethics is the branch of ethics concerned with establishing how people ought to act and what moral standards they should follow. It provides guidelines or rules to judge whether actions are right or wrong, good or bad. In other words, it sets norms or standards for ethical behavior.

Directions:

Each of the next three (03) items consists of two statements, one labelled as the 'Statement (II)'. You are to examine these two statements carefully and select the answers to these items using the codes given below:

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Codes:

- (a) Both Statement (I) and Statement (II) are individually true and Statement (II) is the correct explanation of Statement (I)
- (b) Both Statement (I) and Statement (II) are individually true but Statement (II) is NOT the correct explanation of Statement (I)
- (c) Statement (I) is true but Statement (II) is false
- (d) Statement (I) is false but Statement (II) is true

48. Statement (I): Explicit indicator is the methodology that should suggest specific and measurable indicators to be used to qualify impacts on the relevant environmental parameters.

Statement (II): Magnitude is the methodology that should provide for the measurement of impact magnitude.

48. Ans: (b)

Sol: Statement (I):

"Explicit indicator is the methodology that should suggest specific and measurable indicators to be used to qualify impacts on the relevant environmental parameters."

True - Explicit indicators are clearly defined, specific, and measurable variables used in Environmental Impact Assessment (EIA) to track or evaluate changes in environmental parameters.

Statement (II):

"Magnitude is the methodology that should provide for the measurement of impact magnitude."

Also true - In EIA, magnitude refers to the degree or extent of an environmental impact and is indeed measured as part of impact assessment methodologies.



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49. **Statement (I) :** A country which doubles its capital in ten years will have a higher output per unit of capital than a country which doubles it in twenty years.

Statement (II) : New investment and new technology go together.

49. Ans: (a)

Sol: Statement I correctly indicates that a country which doubles its capital in ten years is likely to have a higher output per unit of capital in the future, implying sustained economic growth and improved productivity.

Statement II correctly states that new investment and technology are the key factors that enable a country to double its capital in a specific period, such as ten years.

Both statements are accurate and complement each other: investment and technology drive growth, which results in doubling capital and higher output over time.

50. **Statement (I) :** An evaluation and identification of sources, types and qualities of pollutants generated by different phases of project activity.

Statement (II) : In activity step model for environmental impact assessment studies, the detailed evaluation of existing ambient air quality, meteorological conditions and nuclear air quality existing in the project area.

50. Ans: (b)

Sol: Statement I is True

"An evaluation and identification of sources, types and qualities of pollutants generated by different phases of project activity."

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This statement describes one of the core functions of Environmental Impact Assessment (EIA): to assess potential pollutants (air, water, noise, etc.) produced during different project phases – construction, operation, decommissioning.

Statement II is True

"The activity step model is a systematic framework used in EIA to evaluate how various project activities impact the environment

51. Which one of the following is the advantage of an 'equity capital'?

- (a) Dividends paid by a company are not tax deductible
- (b) Equity holders expect greater return as they undertake more risk
- (c) Equity shares are not repayable to the shareholders as these are nonrefundable
- (d) Issue of equity shares also result in dilution of control of the company

51. Ans: (c)

Sol: An equity share (or ordinary share) represents ownership in a company. When you buy equity shares, you become a part-owner of the company.

Equity shares are not a loan.

- The company is not required to pay back the money to shareholders.
- Once shareholders buy shares (through IPO or later issues), the money belongs to the company permanently (unless it voluntarily decides to buy back shares).
- There is no fixed maturity date for equity shares.
- Shareholders can only sell their shares in the stock market to other investors the company is not obliged to buy them back.



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- 52. Which one of the following branch of economics is focusing on improving fiscal, economic and social conditions in developing (low income) countries?
 - (a) Social economics
 - (b) Fiscal economics
 - (c) Development economics
 - (d) Micro economics

52. Ans: (c)

- **Sol:** Development Economics deals with understanding the economic aspects of the development process in low-income countries. It studies how to promote economic growth, reduce poverty, and improve living standards.
- 53. Which one of the following is correct with respect to the Industrial Relations Bill?
 - (a) Workers can raise objection to retrenchment within five years
 - (b) Government consent required for workers to move courts in case conciliation fails
 - (c) Trade union deemed registered if application not processed within six months by government
 - (d) Labour court, board of arbitration and tribunal court won't exist; only industrial tribunal to continue

53. Ans: (c)

- **Sol:** The Industrial Relations Code, 2020 (often called the Industrial Relations Bill) provisions says that: If an application for registration of a trade union is not processed by the government within six months, the trade union will be deemed registered. This is intended to reduce bureaucratic delays and ensure timely recognition of trade unions.
 - a) No such provision is present in the Code.



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- b) The Code does not impose such a restriction; workers can approach the tribunal if conciliation fails.
- d) While the Code consolidates dispute resolution under Industrial Tribunals, the claim that the other bodies "won't exist" is an oversimplification the transition and roles are more nuanced.
- 54. What is PPP in sustainable agricultural sector?
 - (a) Public Product Percentage
 - (b) Present Product Partnership
 - (c) Public Private Partnership
 - (d) Present Private Percentage

54. Ans: (c)

- **Sol:** PPP = Public-Private Partnership
 - It is a collaborative arrangement between:
 - Public sector (government or government agencies)
 - Private sector (companies, NGOs, farmer organizations, investors)
- 55. Which one of the following is an effort to get to the next stage of creating a pan-India electronic portal, which networks the existing APMC mandis by creating a national market for agricultural commodities?
 - (a) National APMC Market
 - (b) National Agricultural Market
 - (c) National Network Portal
 - (d) National Electronic Portal

55. Ans: (b)

Sol: In India, agricultural marketing is often done through APMC mandis (Agricultural Produce



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General Studies & Engg. Aptitude

Market Committees), which are regulated by state governments.

Traditionally, these markets were fragmented, and farmers had to sell in their local mandis only.

To improve price discovery, reduce middlemen, and create a single national market for agricultural produce, the Government of India launched an initiative called:

e-NAM = National Agricultural Market

- It is an online trading platform for agricultural commodities.
- It aims to link all the APMC mandis across India.
- 56. Which one of the following Yojanas replaces two schemes Agricultural Insurance Scheme (NAIS), 1999 as well as the Modified National Agricultural Insurance Scheme (MNAIS), 2010 by incorporating the best features of all these schemes while removing the previous short- comings and weaknesses ?
 - (a) Pradhan Mantri Krishi Sinchayee Yojana
 - (b) Pradhan Mantri Fasal Sinchayee Yojana
 - (c) Pradhan Mantri Krishi Bharat Yojana
 - (d) Pradhan Mantri Fasal Bima Yojana

56. Ans: (d)

Sol: The Pradhan Mantri Fasal Bima Yojana (PMFBY) was launched in 2016.

It is a crop insurance scheme that replaced:

- National Agricultural Insurance Scheme (NAIS), 1999
- Modified National Agricultural Insurance Scheme (MNAIS), 2010

The aim of PMFBY is to:

Provide comprehensive crop insurance

Incorporate the best features of previous schemes Remove shortcomings such as delays in claim settlement, high premiums, and low coverage Ensure faster claim settlement using technology (like remote sensing and drones)

- 57. Which one of the following is not the principle of India's Foreign Policy for Panchsheel ?(a) Mutual non-interference in each other's affairs(b) Mutual contentions
 - (c) Equality and mutual benefit(d) Peaceful co-existence

57. Ans: (b)

Sol: The 5 principles of Panchsheel are: Mutual respect for each other's territorial integrity and sovereignty Mutual non-aggression Mutual non-interference in each other's internal affairs Equality and mutual benefit

Peaceful co-existence

- 58. Government's strategy in respect of public expenditure and revenue can have significant impact on the business is called(a) Monetary policy(b) Fiscal policy
 - (c) Trade policy (d) Industrial policy

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58. Ans: (b)

Sol: Fiscal policy refers to the government's use of spending and taxation to influence the economy, aiming to achieve economic stability, growth, and manage inflation.



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Questions with detailed solutions

- 59. Which of the following arguments advanced in favour of labour-intensive techniques?
 - 1. In underdeveloped countries there is an acute shortage of capital and entrepreneurial resources
 - 2. There is considerable saving in foreign exchange
 - 3. These techniques quickly increase the supply of consumable goods and obviate the danger of inflation
 - 4. More employment will be offered to the labour force in the long run
 - (a) 1, 2 and 4 only
 - (c) 1, 2 and 3 only
- (b) 1, 3 and 4 only (d) 2, 3 and 4 only

59. Ans: (a)

Sol:

- Scarcity • Statement1: capital of and entrepreneurship makes labor-intensive techniques suitable for underdeveloped countries.
- Statement 2: Labor-intensive methods save foreign exchange by reducing dependence on imported machinery.
- Statement 3: While increasing production can help with inflation, labor-intensive techniques might not quickly increase the supply of consumable goods compared to modern, capital-intensive methods which often have higher productivity. The relationship with inflation is complex and depends on many factors, including the efficiency of the labor-intensive production.
- Statement 4: Labor-intensive approaches generate employment, addressing widespread more joblessness in the long run.

General Studies & Engg. Aptitude

- 60. Which of the following features regarding 'Shram Suvidha Portal' are correct?
 - 1. Unique labour identification number (LIN) will be allotted to units to facilitate online registration
 - 2. Mandatory uploading of inspection reports within 72 hours by labour inspectors
 - 3. Timely redressal of grievances will be ensured with the help of the portal
 - (a) 1, 2 and 3
- (b) 1 and 2 only (b)

- (c) 1 and 3 only
- (d) 2 and 3 only

60. Ans: (a) Sol:

- Unique labour identification number (LIN) will be allotted to units to facilitate online registration: This is a correct feature of the Shram Suvidha Portal. The portal aims to consolidate and streamline various labor compliance requirements, and the LIN is a key component for facilitating online registration and reporting for establishments.
- Mandatory uploading of inspection reports within 72 hours by labour inspectors: This is also a correct feature. The Shram Suvidha Portal was designed to bring transparency and accountability to labor inspections, with a provision for mandatory uploading of inspection reports by labor inspectors within a specified timeframe, often stated as 72 hours.
- Timely redressal of grievances will be ensured with the help of the portal: This is a primary objective and feature of the Shram Suvidha Portal. The portal serves as a platform for workers and employers to register grievances and aims to ensure their timely resolution, thereby improving industrial relations and compliance.



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61. In a triangle ABC, if the values of a = 3, b = 4 and

sin A = $\frac{3}{4}$, then the angle $\angle B$ will be (a) 30° (b) 45° (c) 60° (d) 90°

61. Ans: (d)

Sol: Given that a = 3, b = 4 and sin(A) = 3/4



In only triangle ABC, we have the following sine rule.

 $\frac{a}{\sin(A)} = \frac{b}{\sin(B)} = \frac{c}{\sin(c)} = 2R$ Consider $\frac{a}{\sin(A)} = \frac{b}{\sin(B)}$ $\Rightarrow \frac{3}{\frac{3}{4}} = \frac{4}{\sin(B)}$ $\Rightarrow \sin(B) = \frac{4}{3} \times \frac{3}{4}$ $\Rightarrow \sin(B) = 1$ $\therefore B = 90^{\circ}$

62. In an area of an ellipse, if one percent error is made in measuring the major and minor axis, the percentage error will be

(a)
$$2\%$$
 (b) 3% (c) 4% (d) 5%

62. Ans: (a)

Sol: Area of ellipse (a) = π .a.b

$$\left(x + y + \frac{xy}{100}\right)\%$$
 (where two percentages given)



General Studies & Engg. Aptitude

$$\left(1+1+\frac{1(1)}{100}\right)\%$$

1% + 1% = 2%.

= 2% (Approximately 2.01) Procedure $A = \pi ab$. we need to differentiate area formula with respect a

and b.

derivative of 'A' with respect 'a' $\rightarrow \frac{dA}{da} = \pi b$

respect 'b' $\rightarrow \frac{dA}{db} = \pi a$ percentage error in both a & b is $\rightarrow 1\%$

(a)
$$\frac{3\pi a^2}{8}$$
 (b) $\frac{3\pi a^3}{8}$
(c) $\frac{8\pi a^2}{3}$ (d) $\frac{8\pi a^3}{3}$

63. Ans: (d) Sol: Given that $R = a (1 - \cos \theta)$



The volume of the solid is generated by rotating the upper half of the cardioid about the initial line $\theta = 0$. For the region above the initial line $\theta = 0$. For the region above the initial line $\theta = 0$, θ varies from 0 to π .



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Hearty Congratulations

To our students CIVIL ENGINEERING Selected in SSC JE - 2024



Total 150+ Selections CE-98 EE-29 ME-24

Questions with detailed solutions

ESE - 2025

Preliminary Examination



The formula of volume of solid generated by revolving the area bounded by curve $R = f(\theta)$ and the radii vectors $\theta = \theta_1 \& \theta = \theta_2$ about the initial line is given by

$$V = \frac{2\pi}{3} \int_{\theta=\theta_1}^{\theta_2} R^3 \cdot \sin(\theta) d\theta = \frac{2\pi}{3}$$
$$\int_0^{\pi} a^3 (1 - \cos \theta)^3 \cdot \sin \theta \, d\theta$$
$$\Rightarrow V = \frac{2\pi}{3} a^3 \left[\frac{(1 - \cos \theta)^4}{4} \right]_0^{\pi}$$
$$\left(\because \int f^1(x) (f(x))^n dx = \frac{(f(x))^{n+1}}{n+1} \right)$$
$$\Rightarrow V = \frac{\pi}{6} a^3 [(1 - \cos(\pi))^4 - (1 - \cos 0)^4]$$
$$\Rightarrow V = \frac{\pi}{6} a^3 [(2)^4 - (0)]$$
$$\therefore V = \frac{8}{3} \pi a^3$$

64. In how many ways can 5 prizes be distributed among 4 candidates when every candidate can take one or more prizes ?
(a) 1024 (b) 625 (c) 600 (d) 120

64. Ans: (a)

Sol: 5 prices \rightarrow For 4 persons every candidate can take one or more.

First price \rightarrow out of $4 \rightarrow$ any one candidate 4_{c_1} 2^{nd} price \rightarrow out of $4 \rightarrow$ any one get $\rightarrow 4_{c_1}$ etc. Sprices $\rightarrow 4 \times 4 \times 4 \times 4 \Rightarrow 4^5 = 1024$.

General Studies & Engg. Aptitude

65. Consider the following equation: (x + y + 1) dx + (2x + 2y + 3) dy = 0Solving the equation will be (a) u - log(u + 1) = x + c(b) 2u + log(u-1) = x + c(c) 2u - log(u + 1) = x + c(d) u + log(u - 1) = x + cwhere u is (x + y + 1)

65. Ans: (c)
Sol: Given that
$$\frac{dy}{dx} = \frac{-(x+y+1)}{2x+2y+3}$$
....(1)
 $\Rightarrow \frac{dy}{dx} = \frac{-(x+y+1)}{2(x+y+1)+1}$(2)
Let $x+y+1 = 4$ (3)
Then $1 + \frac{dy}{dx} + 0 = \frac{du}{dx}$(4)
Put (3) & (4) in (2), we get
 $\frac{du}{dx} - 1 = \frac{-u}{2u+1}$
 $\Rightarrow \frac{du}{dx} = 1 - \frac{u}{2u+1}$
 $\Rightarrow \frac{du}{dx} = \frac{2u+1-u}{2u+1}$
 $\Rightarrow \frac{du}{dx} = \frac{2u+1-u}{2u+1}$
 $\Rightarrow \int \frac{2u+1}{u+1} du = \int 1 dx + c$
 $\Rightarrow \int \frac{(2u+1+1)-1}{u+1} du = x + c$
 $\Rightarrow \int [2 - \frac{1}{u+1}] du = x + c$
 $\therefore 2u - \log(u+1) = x + c$ is a G.S of (1)



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Questions with detailed solutions

66. If 8 children and 8 men complete certain job in 6 days and if each child takes twice the time taken by a man to finish the same work, in how many days 8 men will finish the same work?(a) 12 days(b) 10 days

(a) 12 days	(0) 10 uu
(c) 9 days	(d) 8 days

66. Ans: (c)

Sol: 8 children $+ 8 \text{ men} \rightarrow 6 \text{ days}$

8 men \rightarrow ? children \rightarrow Twice the time taken by A man. children $\rightarrow \frac{m}{2}$ days.

$$8\left(\frac{m}{2}\right) + 8m \rightarrow 12mm \rightarrow 6$$
 days

 $8 \text{ men} \rightarrow ?$ 12 (6) = 8 (x)x = 9 day.

67. Consider the following matrix :

 $\mathbf{A} = \begin{bmatrix} -2 & 2 & -3\\ 2 & 1 & -6\\ -1 & -2 & 0 \end{bmatrix}$

The Eigen values are (a) -3, -3 and 5 (b) -3, 3 and -5(c) 3, 3 and -5 (d) 3, -3 and 5

67. Ans: (a) Sol: Given that $A = \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & 2 & 0 \end{bmatrix}$

Let λ_1 , λ_2 & λ_3 be the required eigen values of a given matrix $A_{3\times 3}$.

Then (i) $\lambda_1 + \lambda_2 + \lambda_3 = tr(A) = -2 + 1 + n = -1 \dots$ (i) Here, the above equation (1) statistics with only Option (a)

: Option (a) is true (i.e $\lambda_1 = -3$, $\lambda_2 = -3$ & $\lambda_3 = 5$).

General Studies & Engg. Aptitude

68. If at a get-together 22 people shake their hands with each other, how many handshakes will take place in all?
(a) 132 (b) 231 (c) 321 (d) 484

68. Ans: (b)

Sol: No of shake hands $\rightarrow n_{c_2}$

$$22_{c_2} = \frac{22 \times 21}{2} = 2 \times 21 = 231$$

69. If $\vec{v} = (xyz)\hat{i} + (3x^2y)\hat{j} + (xz^2 - y^2z)\hat{k}$, the value of divergence of \vec{v} at point (2, -1, 1) will be (a) 14 (b) 16 (c) 18 (d) 20

69. Ans: (a)

Sol: Let $\overline{V} = f_1 \overline{i} + f_2 \overline{j} + f_3 \overline{k} = (xyz)\overline{i} + (3x^2y)\overline{j} + (xz^2 - y^2z)$ and p(x, y, z) = (2, -1, 1)Then the divergence of the vector function \overline{V} is given by $div(\overline{V}) = \nabla \cdot \overline{V} = \frac{\partial f_1}{\partial x} + \frac{\partial f_2}{\partial y} + \frac{\partial f_3}{\partial z}$ $\Rightarrow \nabla \cdot \overline{V} = (yz) + (3x^2) + (2xz - y^2)$

$$\Rightarrow (\nabla, \overline{\nabla})_{p} = (-1)(1) + 3(2)^{2} + [(2)(2)(1) - (-1)^{2}]$$

$$\therefore (\nabla, \overline{\nabla})_{p} = 14$$

70. The square root of the complex number 5 + 12i will be

(a) 3 + 2i, -3 -2i	(b) 2 –3i, –2 –3i
(c) $3-2i$, $3+2i$	(d) 2 + 3i, 2 – 3i

70. Ans: (d)

Sol: If Z = x + iy is a complex number then the square



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root of a complex number z = x + iy are given by $\sqrt{z} = \sqrt{x + iy}$

$$=\pm \left[\sqrt{\frac{1}{2}(\sqrt{x^{2}+y^{2}}+x)}+i\sqrt{\frac{1}{2}(\sqrt{x^{2}+y^{2}}-x)}\right]$$

where 'y' is positive. Now, $\sqrt{5+12i}$

$$=\pm \left[\sqrt{\frac{1}{2}(\sqrt{25+144}+5)} + i\sqrt{\frac{1}{2}(\sqrt{25+144}-5)} \right]$$

$$\Rightarrow \sqrt{5+12i} = \pm \left[\sqrt{\frac{1}{2}(13+5)} + i\sqrt{\frac{1}{2}(13-5)} \right]$$

$$\Rightarrow \sqrt{5+12i} = \pm \left[\sqrt{9} + i\sqrt{4} \right]$$

$$\Rightarrow \sqrt{5+12i} = \pm [3+2i]$$

$$\therefore \sqrt{5+12i} = 3+2i, -3-2i \text{ (or) } 3+2i, -(3+2i)$$

- 71. Three pipes A, B and C can fill a tank in 6 hours. When the tank was empty, all the three pipes were turned on and they worked together for 2 hours, at that instant, pipe C was closed and the pipes A and B continued to work to fill the tank. It took a total of 7 hours from start to fill the tank this way. If pipe C alone is working from the start, the time it takes will be
 - (a) 10 hours (b) 14 hours (c) 30 hours (d) 45 hours

71. Ans: (c)

Sol:

	A + B + C	A + B	С
All pipes work			
(When the tank		2	2
was empty			
Total filling			
time from start	6	7	30
(in hours)			

72. The given number of letters skipped increase in the order of 2, 4, 6, 8, Which of the following series observes the rule given? (a) ADIOVF (b) **BEJOZK**

(c) DGKOTX (d) GIKMO	Q

72. Ans: (b)

0	1		
- N	n	•	
0	U	L	

1 4	9	16	25	34
A D	I	P	Y	Н
4 2 5	10	17	26	37
B 5 E	J	Q	Z	K

73. The weight of 3 mangoes and 2 apples is 255 grams. The weight of 2 mangoes and 3 apples is 285 grams. Each mango weighs the same and each apple weighs the same. The combined weight of 1 mango and 1 apple will be (b) 104 grams

(d) 114 grams

(a) 98 grams

(c) 108 grams

73. Ans: (c)

Sol:
3 Mango + 2 Apple
$$\rightarrow$$
 255
2 Mango + 3 Apple \rightarrow 285
5 Mango + 5 Apple = 540

1 Mango + 1 Apple = $\frac{540}{5}$ = 108

- 74. A builder decided to build a farm-house in 40 days. He employed 100 men in the beginning and 100 more after 35 days and completed the construction in the stipulated time. If he had not employed additional men, how many days behind the schedule the construction would have been finished?
 - (a) 2 days (c) 10 days

· /		2	
(d)	15	days	S

(b) 5 days



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Gollangi Sateesh

Rohan Biswal























Neelava Mukherjee



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Nimesh Chandra

Harshil Maheshwari

Sec.

Nimish Upadhyay

Kaushal Kumar Kaushik

Hemanth Reddu P





































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completely, the time taken will be

- (a) 10 sec
- (c) 18 sec

75. Ans: (a)

Sol:

Time = $\frac{L(t_1) + L(t_2)}{S(t_1) + S(t_2)}$ (or) $\frac{\text{sum of (length)}}{\text{sum of (speed)}}$ = $\frac{120 + 80}{(42 + 30) \times \frac{5}{18}}$ = $\frac{200}{20} = 10 \text{ sec}$

(b) 15 sec (d) 20 sec

76. One student gets 20% of marks in an examination and fails by 30 marks. Another student secures 32% of marks and gets 42% marks more than that required to pass. The percentage of marks required to pass in that examination will be

(a) 22% of marks	(b) 25% of marks
(c) 28% of marks	(d) 30% of marks

76. Ans: (b) Sol:



77. A concrete post, planted vertically in a lake is seen with its top 7 m projecting above the water surface.

If its $\frac{1}{3}$, $\frac{1}{4}$ and $\frac{1}{8}$ parts of the length are in water, mud and sand respectively, the length of the post will be

(a) 24 m (b) 27 m (c) 36 m (d) 42 m

77. Ans: (a) Sol: If length of post is 'x'

$$\frac{1}{3}x + \frac{1}{4}x + \frac{1}{8}x + 7 = x$$

on solving x = 24

78. The value of a machine depreciates every year by 5%. If the present value of the machine be ₹100,000, its value after 3 years will be nearly

(a) ₹95,198	(b) ₹90,376
(c) ₹87,556	(d) ₹85,738



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78. Ans: (d)

Sol: Value of machine after 3 years = $100000 \left(1 - \frac{5}{100}\right)^3$

$$= 100000 \left(1 - \frac{1}{20}\right)^{3}$$
$$= 100000 \left(\frac{19}{20}\right)^{3}$$
$$= 100000 \times \frac{6859}{8000}$$
$$= 85737.5$$

79. A construction work is to be completed in 46 days by 117 men at work, 8 hours being the working period per day. After 33 days, it is found that only 4/7 of the work is completed. If the working time is increased to 9 hours/day, the number of additional men required to complete the work in 46 days period will be

(a) 72 men

- (c) 90 men
- 79. Ans: (b)

Sol:

m	
117	
2	

8

9

(b) 81 men

(d) 99 men

w

4/7

3/7nce

 $m_1 d_1 h_1 w_2 = m_2 d_2 h_2 w_1$ $117 \times 33 \times 8 \times 3/7 = m_2 \times 13 \times 9 \times 4/7$ $m_2 = 198$ Hence we need (198 – 117) = 81 men additionally

d

33

13

- 80. A man spends $\frac{2}{5}$ of his salary on groceries and $\frac{3}{10}$ of the remaining on his clothes. If he saves ₹10,500, his monthly salary will be
 - (a) ₹30,000(b) ₹15,000(c) ₹20,000(d) ₹25,000

80. Ans: (d)

Sol: Salary \rightarrow x say $\frac{2}{5}(x) \rightarrow$ groceries remaining $\rightarrow \frac{3}{5}$ $\frac{3}{10} \text{ of}\left(\frac{3}{5}\right) \times \Rightarrow$ cloths groceries + cloths $= \frac{2}{5} + \frac{3}{10} \times \frac{3}{5}$ $= \frac{2}{5} + \frac{9}{50}$ Remaining $= 1 - \frac{29}{50} = \frac{29}{50}$ (salary) = saving $\frac{21}{50}$ (salary) = 10,500 Salary = 25000

81. Which one of the following management functions is correct during the preproduction phase?

(a) Organize (b) Control

(d) Staff

81. Ans: (c)

(c) Plan

- Sol: Planning is the main Management function of Preproduction. The rest of the functions Organizing, controlling and staffing are part of Production phase.
- 82. Which one of the following charts is used in the control charts for monitoring service quality characteristics for number of daily customer complaints in a hotel?

(a) R-chart	(b) $\overline{\mathbf{X}}$ -chart
(c) p-chart	(d) c-chart



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HARSHIT PANDEY



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VIDHU SHREE





RAJVARDHAN SHARMA AKSHAY VIDHATE







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AMAN PRATAP SINGH AIR







CHANDAN JOSHI



82. Ans: (d)

- **Sol:** A c-chart is used for monitoring the number of occurrences of a specific event (in this case, daily customer complaints) within a fixed sample or time period. Since you're tracking the number of complaints (a count), a c-chart is the appropriate choice. It is commonly used in situations where the data represents counts of defects or occurrences.
- 83. The reliability number in sampling process is
 - (a) $100 + \left[\frac{\text{Number of defective units}}{\text{Number of units tested}} \times 100\right]$
 - (b) $100 \left[\frac{\text{Number of defective units}}{\text{Number of units tested}} + 100\right]$

(c)
$$100 - \left[\frac{\text{Number of defective units}}{\text{Number of units tested}} \times 100\right]$$

(d) $100 + \left[\frac{\text{Number of defective units}}{\text{Number of units tested}} - 100\right]$

83. Ans: (c)

Sol: "Reliability number" in a sampling context is simply the percent of units that are not defective. If you test N units and find D defectives, then Reliability (%)

$$=\frac{\mathbf{N}-\mathbf{D}}{\mathbf{N}}\times100=100-\left(\frac{\mathbf{D}}{\mathbf{N}}\times100\right).$$

That matches option (c).

 $100 - \left[\frac{\text{Number of defective units}}{\text{Number of units tested}} \times 100\right].$

- 84. Which of the following are the noise factors for the experiment on the 'Elastomeric Connector'?
 - 1. Conditioning time
 - 2. Interference
 - 3. Conditioning temperature 4. Connector wall thickness



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(a) 1 and 2 only(c) 3 and 4 only

(b) 2 and 4 only (d) 1 and 3 only

84. Ans: (d)

- Sol: A noise factor is a variable that affects the outcome of an experiment but is not under the direct control of the experimenter. In the context of an elastomeric connector experiment, "conditioning time" and "conditioning temperature" are considered noise factors because they are environmental conditions that can influence the connector's performance but are not intentionally set by the researcher.
- 85. Which of the following are the internal factors that influence customer perception of service quality?
 - 1. Knowledge explosion
 - 2. Annual and quarterly reports
 - 3. Social values and changes in lifestyle
 - 4. Increase consumer participation in service delivery through motivated employees
 - (a) 1 and 3 only (b) 1 and 4 only
 - (c) 2 and 4 only (d) 2 and 3 only

85.9 Ans: (c)

Since

- **Sol:** Internal factors influencing customer perception of service quality are those that stem from within the organization or its direct interactions with customers. Let's break it down:
 - 1. **Knowledge explosion:** This is an external factor (e.g., increasing access to information) and would not directly be classified as an internal factor.
 - 2. Annual and quarterly reports: These are internal factors since they provide important



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insights into a company's performance, which can influence customer perception of reliability and professionalism.

- 3. Social values and changes in lifestyle: These are external factors, as they stem from society and culture, not from within the company.
- 4. Increase consumer participation in service delivery through motivated employees: This is an internal factor because it directly involves how a company organizes and motivates its workforce, impacting customer service quality.
- 86. Which one of the following statements is correct regarding TQM ?
 - (a) It proposes hierarchical organization structure
 - (b) It has a result oriented approach
 - (c) Its technical efficiency and cost cutting approaches are dominant
 - (d) It advocates a flatter organization structure with large span of control where authority is pushed as far down as possible

86. Ans: (d)

Sol: Total Quality Management (TQM) emphasizes continuous improvement, customer satisfaction, and employee involvement. To achieve these, TQM often advocates a flatter organizational structure where decision-making is pushed down to lower levels in the organization. This approach fosters empowerment, encourages employee participation, and enables faster decision-making at all levels, which are key principles of TQM.



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- 87. Which of the following are the core steps of 'Six Sigma' methodology?
 - (a) Improve, control and measure
 - (b) Define, measure and analyze
 - (c) Design, verify and control
 - (d) Measure, analyze and define

87. Ans: (b)

- **Sol:** The core steps of Six Sigma are typically part of the DMAIC methodology, which stands for:
 - 1. **Define** Define the problem, project goals, and customer (internal and external) requirements.
 - 2. **Measure** Measure the current process performance and gather relevant data.
 - 3. **Analyze** Analyze the data to identify root causes of problems or defects.
 - 4. **Improve**–Improve the process by implementing solutions to eliminate the root causes.
 - 5. **Control** Control the improved process to ensure that gains are sustained.
- 88. Which one of the following is the correct UCL for central limits of non-confirming units with constant or variable sample size in control charts for attributes?

(a)
$$\overline{P} + \sqrt{3 \frac{\overline{P}(1-\overline{P})}{n}}$$
 (b) $\overline{np} + 3\sqrt{np(1-\overline{p})}$
(c) $\overline{c} + 3\sqrt{\overline{c}}$ (d) $\overline{u} + 3\sqrt{\frac{\overline{u}}{n}}$

88. Ans: (a)

Sol: P-chart is the right choice for the given conditions like non-conforming units with constant or variable sample size in control charts for attributes. However



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the upper control limit for 'P' chart is as follows $UCL_{p} = \overline{P} + 3\sigma_{\overline{P}}$

$$=\overline{P}+3\sqrt{\frac{\overline{P}(1-\overline{P})}{n}}$$

- 89. Which one of the following relation is correct for np regarding quality control ?
 - (a) Total number rejected / defective Number of sample
 - (b) Total number rejected/defective Total number inspected
 - (c) <u>Total number defects in all units</u> Total number of units
 - (d) Total number defects in all units Number of sample

89. Ans: (*)

Sol: p-chart

Fraction defective

 $(p) = \frac{No.of defectives (or)rejected}{sample size (n)}$

nP-chart

np = Fraction defective × sample size

 $= \frac{\text{No. of defectives}}{\text{sample size (n)}} \times \text{sample size (n)}$

np = No. of defectives (or) rejected. Central line (CL)

 $n\overline{p} = \frac{No. of defectives}{No. of samples}$

- 90. Nitrate when present in excess in drinking water causes
 - (a) Fluorosis (b) Minamata
 - (c) Blur baby syndrome (d) Itai-itai

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90. Ans: (c)

Sol: Excessive nitrate in drinking water can lead to blue baby syndrome (also known as methemoglobinemia), particularly in infants. This occurs when high levels of nitrates in water are converted to nitrites in the body. Nitrites interfere with the blood's ability to carry oxygen, leading to a condition where the skin of babies may appear bluish due to oxygen deprivation.

91. About 80% of the failures of mechanical components are due to which one of the following failure resulting from the fluctuating stresses?(a) Shear failure

- (b) Fatigue failure
- (c) Dynamic load failure
- (d) Normal shear failure

91. Ans: (b)

- **Sol: Fatigue failure:** It is a type of failure due to dynamic loads or cyclic loads. About 80% of the failures of mechanical components are due to fatigue failure. they are catastrophic in nature.
- 92. Consider the following steps regarding basic procedure of design of machine element :
 - 1. Select suitable material for element
 - 2. Specify functions of elements
 - 3. Determine failure mode of element
 - 4. Determine forces acting on element

What is the correct sequence of these steps?

- (a) 2, 4, 1 and 3. (b) 1, 2, 3 and 4
- (c) 2, 1, 4 and 3 (d) 4, 2, 3 and 1

92. Ans: (a)

- **Sol:** The correct order is : Specify functions of elements -> Determine the forces ->Select suitable material
 - -> Determine the Failure Mode.



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- 93. A plane oblique to axis and making same angle with axis as elements do is called
 - (a) Circle (b) Ellipse
 - (c) Parabola
- (d) Hyperbola

93. Ans: (c)

- **Sol:** Here the cutting plane is parallel to the generator the cone then the conic section is a parabola
- 94. Which of the following projections is not a type of parallel projection?
 - (a) Conic projection
 - (b) Oblique projection
 - (c) Orthogonal projection
 - (d) Curvilinear projection

94. Ans: (c)

- **Sol:** Geometrical projections are broadly divided into two main categories:
 - 1. **Parallel Projection:** In this type, the lines of sight (or projectors) from the object to the projection plane are parallel to each other. The center of projection is considered to be at infinity.
 - Orthogonal projection is a type of parallel projection where the projectors are perpendicular (at a 90° angle) to the plane of projection.
 - Oblique projection is a type of parallel projection where the projectors are not perpendicular to the plane of projection.
 - 2. **Perspective Projection (or Conic Projection):** the lines of sight (projectors) are not parallel. They converge at a single point called the center

of projection, which is at a finite distance from the projection plane. This method produces more realistic, three-dimensional-looking images.

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- 95. When the receding lines are drawn to full size scale and the projectors inclined at an angle of 30° or 45° or 60° to the plane of projection, such oblique projection is known as
 - (a) Cavalier projection
 - (b) Cabinet projection
 - (c) Parallel projection
 - (d) Isometric projection

95. Ans: (a)

- **Sol:** In oblique projection, when the receding lines (projectors) are drawn at their full scale and inclined at typical angles of 30°, 45°, or 60° to the projection plane, this style is known as Cavalier projection
- 96. When an observer looks towards an object from infinity, the lines of sights (projectors) will be parallel to each other and inclined to the plane of projection. The resulting projection is known as
 - (a) Isometric projection
 - (b) Orthographic projection
 - (c) Oblique projection
 - (d) Axonometric projection

96. Ans: (c)

Sol: When projectors are parallel to each other and inclined to the plane of projection, the resulting method is known as oblique projection. This is a type of parallel projection, where the front face is shown in true shape and the depth is represented on an angle.



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- 97. Which one of the following systems is recommended in general rules for dimensioning?
 - (a) Aligned system
 - (b) Bidirectional system
 - (c) Multidirectional system
 - (d) Unidirectional system

97. Ans: (a)

- **Sol:** The Bureau of Indian Standards (BIS) recommends the aligned dimension system in technical drawings.
- 98. Any safety programme will be ineffective if any attempt is made to control accidents without first creating
 - 1. Proper safety philosophy
 - 2. Teaching safety principles
 - 3. Eliminating mis-conceptions about the causes of accidents
 - (a) 1 and 2 only(c) 2 and 3 only
- (b) 1 and 3 only (d) 1, 2 and 3

98. Ans: (d)

- **Sol:** For any safety programme to be effective, it is essential to:
 - Create a proper safety philosophy: Establishing a strong foundation or culture around safety ensures everyone understands its importance and integrates it into daily operations.
 - Teach safety principles: Training and education help individuals understand what constitutes safe behavior and how to avoid risks.
 - Eliminate misconceptions about the causes of accidents: Misunderstandings can lead to ineffective solutions. Addressing root causes accurately is vital for prevention.



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- 99. The Mechanical Engineering designer's problem is to attempt to minimize the factors that affect the fatigue life; these are
 - 1. Electrolyte concentration
 - 2. Temperature
 - 3. Fluid flow rate around specimen
 - (a) 1, 2 and 3 (b) 1 and 2 only
 - (c) 1 and 3 only (d) 2 and 3 only

99. Ans: (d)

Sol: Fatigue life, or how long a material can withstand repeated stress cycles before failing, is affected by a combination of factors including material properties, applied stress, environmental conditions, and surface conditions. Higher stress levels, material defects, and aggressive environments generally lead to shorter fatigue life.

The Statements 2 and 3 focus on environmental conditions in terms of fatigue life.

- 100. Which of the following statements are correct with respect to mechanical design categories?
 - 1. Failure of the part would endanger human life, or the part is made in extremely large quantities;
- 995 consequently, an elaborate testing program is justified during design
 - 2. The part is made in less quantities that a moderate series of tests is feasible
 - 3. The part is made in such small quantities that testing is not justified at all; or the design must be completed so rapidly that there is not enough time for testing
 - (a) 1 and 2 only (b) 1 and 3 only
 - (d) 1, 2 and 3

100. Ans: (a)

(c) 2 and 3 only

Sol: Design Testing is a very important activity and it cannot be ignored.



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