ACE Engineering Academy
Leading Institute for ESE/GATE/PSUs

ace online

ESE - 2026

Preliminary Examination

QUESTIONS WITH DETAILED SOLUTIONS

GENERAL STUDIES & ENGINEERING APTITUDE

(SET-B)

ACE Engineering Academy has taken utmost care in preparing the **ESE-2026** Examination solutions. Discrepancies, if any, may please be brought to our notice. ACE Engineering Academy do not owe any responsibility for any damage or loss to any person on account of error or omission in these solutions. ACE Engineering Academy is always in the fore front of serving the students, irrespective of the examination type **(GATE/ESE/IRMS/SSC/RRB/PSUs/PSC/GENCO/TRANSCO etc.,).**

All Queries related to **ESE-2026** Solutions are to be sent to the following email address **help@ace.online**

General Studies & Engineering Aptitude (SET - B)

SUBJECTWISE WEIGHTAGE

S.No.	Name of the Subject	Number of Questions
1	Current Issues & Background Concepts of Social Economic and industrial development	10
2	Engineering Aptitude	15
3	Engineering Mathematics and Numerical Analysis	16
4	General Principles of Design, Drawing, Importance of Safety	9
5	Standards and Quality practices in production, construction, maintenance and services	3
6	Basics of Energy and Environment	8
7	Basics of Project Management	5
8	Basics of Material Science and Engineering	6
9	Information and Communication Technologies (ICT)	16
10	Ethics and values in Engineering profession	12
Total No. Of Questions		**100**

01. Consider the following statements regarding ethics:
1. Ethics is to provide us with moral principles or universal rules that tell us what to do.
2. The fundamental question of ethics is not "What should I do?" but "What kind of person should I be?"

Which of the above statements is/are correct?

(a) 1 only (b) 2 only
(c) Both 1 and 2 (d) Neither 1 nor 2

01. Ans: (c)

Sol: Statement 1:

Ethics provides moral principles or universal rules that guide human conduct and help us decide what actions are right or wrong. This view is associated with rule-based or duty-based ethics, where following principles such as honesty, fairness, and justice helps determine what we should do in a given situation.

Statement 2:

Another important perspective in ethics focuses on character rather than rules. It asks "What kind of person should I be?", emphasizing the development of virtues like integrity, courage, and compassion. This approach, known as virtue ethics, holds that a good character naturally leads to right actions.

02. Consider the following statements regarding Risk-Benefit Analysis:

The major reason for the analysis of the risk benefit are
1. to know risks and benefits and weigh them each.
2. to decide on designs, advisability of product/ project.
3. to suggest and modify the design so that the risks are eliminated or reduced.

Which of the above statements are correct?

(a) 1 and 2 only (b) 2 and 3 only
(c) 1 and 3 only (d) 1, 2 and 3

02. Ans: (d)

Sol: Statement 1:

Risk–benefit analysis helps to identify the possible risks and the expected benefits of a product or project and compare them carefully. This comparison allows decision-makers to understand whether the benefits justify the risks involved.

Statement 2:

It is also used to decide the suitability or advisability of a design, product, or project. If the risks are too high compared to the benefits, the project may be postponed, rejected, or redesigned.

Statement 3:

Another purpose of risk–benefit analysis is to improve safety by suggesting modifications in design or process. Through this, risks can be eliminated or reduced, making the product or project safer and more reliable.

03. Consider the following regarding intellectual property rights:

The agreements with World Trade Organization (WTO) and Trade-Related aspects of Intellectual Property System (TRIPS) establish norms and conditions for following instruments of intellectual properties:
1. Patents
2. Copyright
3. Trademark
4. Trade secret

Which of the above instruments of intellectual properties are correct?

ACE Engineering Academy
Since 1995
Leading Institute for ESE/GATE/PSUs

ace online
(A Digital Initiative by ACE Engineering Academy)

AST

ACE Scholarship Test

A National Level Scholarship Test For Engineers

GET 100% SCHOLARSHIPS

ESE | GATE | PSUs – 2027/28

CE | ME | EC | EE | CS | DA | IN

Fee: Rs.100/-

REGISTER NOW!

EXAM DATE & TIME

1st MARCH 2026

11:00 AM TO 12:30 PM

Last Date for Registration: 27th FEB., 2026

EXAM SYLLABUS:

ENGINEERING MATHEMATICS	20 Questions
NUMERICAL ABILITY	20 Questions
VERBAL ABILITY	10 Questions

- No. of Questions: 50
- Total Marks: 75
- Duration: 90 Minutes
- Mode: Online

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

03. Ans: (d)

Sol: The WTO's TRIPS Agreement (Trade-Related Aspects of Intellectual Property Rights) sets minimum standards for the protection and enforcement of different forms of intellectual property among member countries.

Patents are covered under TRIPS to protect new inventions, giving inventors exclusive rights to use and commercialize their inventions for a limited period.

Copyright is also included and protects literary, artistic, musical, and software works, ensuring creators receive recognition and economic benefits.

04. Consider the following statements regarding value education:

1. Value education is that part of education which deals with understanding one's participation in the larger order, and thus ensuring its living.
2. The content of value education must be all-encompassing, i.e., must include all dimensions of a human being as well as levels of human living.
3. The process of value education is essentially a process of self-exploration (self-reflection and self-discovery) Self-exploration does not include self-verification at the level of natural acceptance and experiential validation in living.

Which of the above statements are correct?

(a) 1 and 2 only (b) 2 and 3 only
(c) 1 and 3 only (d) 1, 2 and 3

04. Ans: (a)

Sol: **Statement 1:**

Value education focuses on helping a person understand oneself, society, nature, and the larger order of existence, and to live in harmony with them. Its aim is not only theoretical understanding but also ensuring that this understanding is reflected in one's way of living. Hence, this statement is correct.

Statement 2:

Value education is considered all-encompassing because it deals with all dimensions of a human being thoughts, behavior, work, and realization and also with all levels of living, such as the individual, family, society, and nature. Therefore, this statement is correct.

Statement 3:

The statement says that self-exploration does not include self-verification through natural acceptance and experiential validation. This is incorrect, because in value education, self-exploration specifically includes verifying values in one's own experience and natural acceptance. Hence, this statement is wrong.

05. Consider the following elements regarding quality characteristics:

1. Physical
2. Sensory
3. Time based

Which of the above elements are correct?

(a) 1 and 3 only (b) 2 and 3 only
(c) 1 and 2 only (d) 1, 2 and 3

05. Ans: (d)

Sol: In quality engineering, a "quality characteristic" is a property used to evaluate whether a product or

service meets consumer requirements. These are generally categorized into several distinct classes:

- **Physical:** These are measurable mechanical or chemical properties, such as weight, length, voltage, or viscosity.
- **Sensory:** These relate to human perception and are evaluated through the senses, such as appearance, color, taste, smell, or "feel."
- **Time-based:** These focus on the performance of a product over its lifespan, specifically addressing reliability, durability, and maintainability.

Since all three elements listed—Physical, Sensory, and Time-based—are standard categories used to define and measure quality, they are all correct.

06. Consider the following methods regarding quality improvements in TQM:
1. Robust design
2. Taguchi loss function

Which of the above methods is/are correct?

(a) 1 only (b) 2 only
(c) Neither 1 nor 2 (d) Both 1 and 2

06. Ans: (d)

Sol: Both methods were pioneered by Dr. Genichi Taguchi and are essential pillars of **Total Quality Management (TQM)** for improving product and process quality.

- **Robust Design:** This method focuses on designing products and processes so they are "robust"—meaning they perform consistently despite "noise" (uncontrollable factors like environmental changes or manufacturing variations). Instead of trying to eliminate noise, it focuses on making the design insensitive to it.
- **Taguchi Loss Function:** Unlike the traditional "goalpost" view (where a product is considered good as long as it falls within tolerance limits), Taguchi argued that any deviation from the target value causes a loss to society. This loss increases quadratically as the product moves away from the target value.

By using these methods together, organizations shift from simple inspection to designing quality in," leading to lower costs and higher customer satisfaction.

07. Consider the following statements regarding variations in quality control tools:
1. Common/Random/Chance variations are difficult to trace and difficult to control even under the best condition of operation.
2. Assignable variations are of higher magnitude which can be easily traced and detected.

Which of the above statements is/are correct?

(a) 1 only (b) 2 only
(c) Neither 1 nor 2 (d) Both 1 and 2

07. Ans: (d)

Sol: Common / Random / Chance Variations: Statement 1 is correct because common or chance variations arise from inherent process factors such as minor material differences, machine vibration, or environmental conditions. They are natural to the system, difficult to trace to a single source, and cannot be completely eliminated even under ideal operating conditions—only reduced through process improvement.

Assignable Variations: Statement 2 is also correct because assignable variations result from specific, identifiable causes such as machine faults, operator errors, or defective raw materials. These variations

are usually of larger magnitude, can be detected through control charts, and corrective actions can be taken to remove them.

Hence, both statements accurately describe the nature of variations in quality control.

08. Consider the following statements regarding reverence:
1. Reverence is the feeling of acceptance for excellence.
2. If someone has achieved the state of excellence, we naturally have an acceptance for such a person. This feeling of acceptance for excellence is called reverence.

Which of the above statements is/are correct?

(a) 1 only (b) 2 only
(c) Neither 1 nor 2 (d) Both 1 and 2

08. Ans: (d)

Sol: Statement 1:

Reverence means a feeling of deep respect and acceptance for excellence or higher qualities in a person. It arises when we recognize values such as wisdom, integrity, or noble conduct. Hence, this statement is correct.

Statement 2:

When a person achieves a state of excellence in character, conduct, or understanding, it is natural for others to feel respect and acceptance toward such a person. This feeling of respect for excellence is what is called reverence. Therefore, this statement is also correct.

09. Consider the following statements regarding fulfillment of relationship in human values:

Fulfillment of relationship means

1. ensuring the naturally acceptable feeling in oneself and sharing it with the other.
2. living with responsibility with the other unconditionally.
3. making effort for mutual development, i.e., development of one's own competence and being of help to the other in developing their competence.

Which of the above statements are correct?

(a) 1 and 2 only (b) 2 and 3 only
(c) 1 and 3 only (d) 1, 2 and 3

09. Ans: (d)

Sol: Statement 1:

Fulfilment in a relationship begins with ensuring naturally acceptable feelings (such as trust, respect, affection, and care) within oneself and sharing these feelings with others. When these feelings are genuine and mutually felt, the relationship becomes harmonious. Hence, this statement is correct.

Statement 2:

Fulfilment of relationships also means living with responsibility toward others without conditions. Responsibility here refers to understanding the needs and feelings of the other person and acting with care, rather than expecting something in return. Therefore, this statement is correct.

Statement 3:

Another aspect of fulfillment in relationships is mutual development. This involves improving one's own competence and also supporting others in developing their abilities and well-being, leading to collective growth. Hence, this statement is correct.

10. Consider the following characteristics regarding Harmony in the society–Universal human order:
1. Behaviour with Human Being
2. Continuous Happiness and Prosperity
3. Work with Rest of Nature

Which of the above statements are correct?

(a) 1 and 2 only (b) 2 and 3 only
(c) 1 and 3 only (d) 1, 2 and 3

10. Ans: (d)

Sol: **Statement 1:** Behaviour with Human Being
Harmony in society requires right understanding and right behaviour with other human beings. This includes values such as trust, respect, cooperation, and justice, which ensure peaceful and mutually fulfilling relationships. Hence, this statement is correct.

Statement 2: Continuous Happiness and Prosperity
The aim of understanding the universal human order is to ensure continuous happiness (right feelings) and prosperity (adequate physical facilities) for individuals and society. Therefore, this statement is correct.

Statement 3: Work with Rest of Nature
Harmony in society is not limited to human relationships; it also includes living and working in harmony with the rest of nature. This means using resources responsibly and maintaining ecological balance. Hence, this statement is correct.

11. In an RSA system, the public key of a given user is e = 65, n = 2881. What is the private key of this user?

(a) 638 (b) 725 (c) 2031 (d) 3031

11. Ans: (b)

Sol: e = 65
n = 2881

(i) $n = p \times q = 43 \times 67$

(ii) $\phi(n) = (p-1)(q-1) = (42)(66)$
$= 2772$

(iii) demond $\phi(n) = 1$

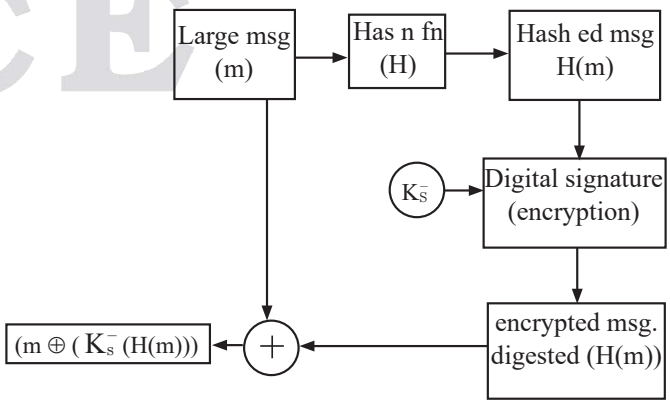
$\Rightarrow$ d. 65 mod 27772 = 1 $\Rightarrow$ d = 725

12. What happens if a k value used in creating a Digital Signature Algorithm (DSA) signature is compromised?

(a) A user's public key is compromised if k is discovered
(b) A user's private key is not compromised if k is discovered
(c) A user's private key is compromised if k is discovered
(d) A user's public key is not compromised if k is discovered

12. Ans: (c)

Sol: In digital signature algorithm, to generate the digital signature.
We use sender 's private key to generate the digital signature.



84 ALL INDIA FIRST RANKS IN GATE

39 ALL INDIA FIRST RANKS IN ESE

ACE Engineering Academy
Since 1995
Leading Institute for ESE/GATE/PSUs

SUMMER

SHORT-TERM BATCHES

HYDERABAD

(Abids & Kothapet)

GATE | PSUs - 2027

23rd APR 2026 | **7th MAY 2026**

21st MAY 2026

BENEFITS

- Structured Learning for Beginners
- Focus on concepts and problem-solving
- Expert Faculty
- Intensive prep

TO WHOM?

- B.Tech 2nd/3rd/4th year students
- Students seeking quick, focused preparation
- Students looking to boost their subject knowledge quickly

Early Bird Discount

₹7,000/- OFF

Valid Till:
28th Feb, 2026

GROUP DISCOUNTS AVAILABLE

H.O. @ Abids: # 3rd Floor, Suryalok Complex, Rosary Convent School Road, Gun Foundry, Basheer Bagh, Hyderabad, Telangana.

B.O. @ Kothapet: # Opp Anutex Shopping Mall, Metro Pillar No. CHPNP-32, 33, Kothapet, Hyderabad, Telangana.

13. Which one of the following is the time complexity of Iterative Deepening in Uninformed Search Strategies?
(a) O(bd) (b) O(bl) (c) O(b^d) (d) O(b^l)

13. Ans: (c)

Sol: Iterative Deepening Search (IDS) combines the advantages of:
- Breadth-First Search → completeness
- Depth-First Search → low memory

Even though IDS repeatedly explores upper levels, the number of nodes at the deepest level dominates the total cost. "Iterative Deepening behaves like BFS in time.".
If b → branching factor (children per node)
d → depth of the optimal solution
Total nodes generated are approximately:
$b^d + b^{d-1} + ... + b \approx b^d$

14. Which one of the following algorithms is used in logic programming systems, which employ sophisticated compiler technology to provide very fast inference?
(a) Backward chaining
(b) Forward chaining
(c) Constraint Satisfaction problem
(d) A* algorithm

14. Ans: (a)

Sol: Logic programming systems such as Prolog primarily use goal-driven inference, which means: Start with the goal (query). Work backwards to find rules and facts that support it.
This is exactly what Backward Chaining does.
Forward chaining → Data-driven (used in production rule systems, expert systems).
Constraint Satisfaction → Used for puzzles, scheduling, optimization.
A* → Search/path finding algorithm.

15. Which one of the following is a disadvantage of call-by-reference technique of passing arguments?
(a) Since arguments are not copied into new variables, it provides faster function space efficiency
(b) The function can change the value of the argument and the change is reflected in the calling function
(c) A function can return only one value. In case we need to return multiple values, we can pass those arguments by reference, so that the modified values are visible in the calling function
(d) If inadvertent changes are caused to variables in called function then these changes would be reflected in calling function as original values would have been overwritten

15. Ans: (d)

Sol: Call-by-reference passes the actual memory address, not a copy.
So any modification inside the called function directly affects the original variable. It results
- Creates side effects
- Makes debugging harder
- Risk of accidental data corruption.

remaining all options are advantages of Call – by – reference Technique of passing arguments.

16. Which one of the following types of programming languages is NOT used to develop the large contents dynamically for server side scripts?
(a) PHP (Hypertext Pre-processor)
(b) Java Server Pages (JSP)
(c) Active Server Pages (ASP)
(d) HTML

16. Ans: (d)

Sol: The question asks which language is NOT used for developing dynamic server-side content.

HTML is a markup language, not a programming language.

- It creates static web pages
- Runs on the client side (browser)
- Cannot process databases or generate dynamic responses

Remaining all can be used to develop the dynamic server side content.

17. In which one of the following layers, the firewalls can be installed to keep good packets and bad packets out?
(a) Physical layer (b) Transport layer
(c) Network layer (d) Application layer

17. Ans: (c)

Sol: A firewall primarily filters traffic based on:

- IP addresses
- Routing information
- Packet headers

These functions belong to the Network Layer (Layer 3) of the OSI model. So the firewall decides:

→ Which packets are allowed.
→ Which packets are blocked

18. In cryptography, to construct an unbreakable cipher text, which one of the following logical operations is used in one-time pads?
(a) XOR (b) AND (c) NAND (d) XNOR

18. Ans: (a)

Sol: A One-Time Pad (OTP) achieves perfect secrecy by combining:
Plaintext ⊕ Random Key = Ciphertext
Here, ⊕ means XOR (Exclusive OR).
As XOR has a special reversible property, while converting Plain Text to Cipher Text, Option A is correct answer.

19. Which one of the following digital certificate standards is used in certificate-based authentication security framework that can be used for providing secure transaction processing and private information?
(a) X.502 (b) X.501
(c) X.510 (d) X.509

19. Ans: (d)

Sol: X.509 is the global standard for digital certificates used in:

- SSL/TLS (secure websites)
- Online banking
- Secure email
- Authentication frameworks

It defines the structure of certificates that verify:

→ Identity.
→ Public key ownership.
→ Certificate Authority (CA)
That is exactly what the question describes: certificate-based authentication + secure transactions + privacy.

20. Which one of the following IEEE standard protocols prescribes a data link-level security which is designed to make the security of a wireless LAN as well as that of wired LAN?
(a) IEEE 802.11 (b) IEEE 802.3
(c) IEEE 802.1 (d) IEEE 802.4

20. Ans: (a)

Sol: IEEE 802.11 is the standard for Wireless LAN (Wi-Fi) and includes built-in data link layer security mechanisms such as:
WEP (Wired Equivalent Privacy) → Designed to provide security comparable to wired LAN.
Later improvements: WPA, WPA2, WPA3.
Notice the phrase in the question: "make the

security of a wireless LAN as well as that of a wired LAN" This directly points to WEP, which belongs to 802.11.

21. How much estimated amount of power can be derived from solid energy mineral of 1 kg of coal?
(a) 1 kWh power (b) 3 kWh power
(c) 4 kWh power (d) 50,000 kWh power

21. Ans: (b)

Sol: 1 kg coal can produce 24 MJ/kg
1 kwh = 3.6 MJ

$\Rightarrow \frac{24}{3.6MJ/kwh} = 6.67$ kwh

It gives around 35% efficiency

$\Rightarrow 0.35 \times 6.67 = 2.33$ kwh $\simeq 3$ kwh

22. Which one of the following types of coal has high calorific value and lowest volatile content?
(a) Anthracite (b) Sub-bituminous
(c) Bituminous (d) Lignite

22. Ans: (a)

Sol: order of highest calorific value
anthracite > bituminous > sub bituminous > Lignite

23. A fuel cell in electric car generates electrical energy by combining
(a) Carbon dioxide (CO_2) and Hydrogen (H_2)
(b) Oxygen (O_2) and Hydrogen (H_2)
(c) Sulphur dioxide (SO_2) and Hydrogen (H_2)
(d) Carbon monoxide (CO) and Hydrogen (H_2)

23. Ans: (b)

Sol: Fuel cell

$H_2 + \frac{1}{2}O_2 \rightarrow H_2O$

$H_2 \rightarrow 2H^+ + 2e^-$

$O_2 + 4e^- + 4H^+ \rightarrow 2H_2O$

24. Electrical power generation usually links to the load demand by a common regional or national network, often called
(a) Station (b) Embedded Generator
(c) Grid (d) Distributor

24. Ans: (c)

25. 1 kg of Hydrogen fuel burns with 8 kg of oxygen to give the product as
(a) 9 kg of hydrogen peroxide
(b) 9 kg of water
(c) 18 kg of hydrogen peroxide
(d) 18 kg of water

25. Ans: (b)

Sol: Law of Conservation of mass

$2H_2 + O_2 \rightarrow 2H_2O$

1 kg + 8 kg of = 9 kg product
Hydrogen oxygen

26. Consider the following statements regarding project:
1. Temporary project has a beginning and an end.
2. Project has predefined work assignments.
3. Project produces a unique output or deliverable.
Which of the above statements are correct?
(a) 1 and 2 only (b) 2 and 3 only
(c) 1 and 3 only (d) 1, 2 and 3

26. Ans: (c)

Sol: A **project** is a temporary and goal-oriented activity undertaken to create a unique product, service, or result. It differs from routine operations because it has a defined start, finish, and specific objectives.

Statement 1: Temporary project has a beginning and an end – Correct.

Every project is time-bound. It starts when objectives are defined and ends when goals are

achieved, cancelled, or resources are withdrawn.

Statement 2: Project has predefined work assignments – Not completely correct.

Projects usually have a plan, but exact work assignments may change as the project progresses due to risks, resource availability, or design changes. Hence they are not strictly predefined.

Statement 3: Project produces a unique output or deliverable – Correct.

A project always creates something new or unique, such as constructing a bridge, developing software, or launching a product.

27. Which one of the following usually provides the resources, particularly the people who are involved in the project?

(a) Sponsor (b) Project Leader
(c) Project Customer (d) Functional Manager

27. Ans: (d)

Sol: In most organizations, especially in matrix or functional structures, resources **(mainly people)** required for a project are provided by the Functional Manager.

- **Sponsor:** Provides financial support, approvals, and overall direction—not day-to-day human resources.
- **Project Leader (Project Manager):** Plans, coordinates, and manages the project but usually does not "own" staff.
- **Project Customer:** The end user or client who defines requirements.
- **Functional Manager:** Heads a department (e.g., HR, Design, Production) and allocates employees to projects as needed.

28. PERT calls for the following estimates to be provided for each activity:

1. Pessimistic 2. Optimistic 3. Most Likely

Which of the above estimates are correct?

(a) 1 and 2 only (b) 2 and 3 only
(c) 1 and 3 only (d) 1, 2 and 3

28. Ans: (d)

Sol: PERT (Program Evaluation and Review Technique) uses three time estimates for each activity to deal with uncertainty:

1. **Optimistic time (t_0):** Minimum possible time to complete the activity under ideal conditions.
2. **Most likely time (t_m):** Time required under normal working conditions.
3. **Pessimistic time (t_p):** Maximum time if problems or delays occur.

All three estimates are essential for calculating the expected activity time using:

$$t_e = \frac{t_0 + 4t_m + t_p}{6}$$

Hence, all the given estimates are correct.

29. Which one of the following means closing down a company and selling its assets?

(a) Liquidation (b) Revitalize
(c) Resurrect (d) Enliven

29. Ans: (a)

Sol: The term that means closing down a company and selling its assets is liquidation.

- Liquidation: Process of winding up a company, settling liabilities, and selling assets to pay creditors.
- Revitalize: To improve or give new life to a company.
- Resurrect: To bring back into operation after failure.
- Enliven: To make something more active or lively.

ACE® Engineering Academy

Since 1995

Leading Institute for ESE/GATE/PSUs

Celebrating 30 YEARS OF EXCELLENCE

84 Times All India 1st Ranks in GATE

39 Times All India 1st Ranks in ESE

ESE | GATE | PSUs

EC | EE | ME | CE | CS | IN | DA

Classroom Coaching @ Hyderabad

ABIDS

H.O. # 3rd Floor, Suryalok Complex,
Rosary Convent School Road,
Basheerbagh, Gun Foundry.

KOTHAPET

B.O. # Besides Swagath Grand,
Opp Anutex Shopping Mall,
Metro Pillar No. CHPNP-32, 33.

REGULAR BATCHES (ESE | GATE | PSUs-2027)

- 21st Feb, 2026
- 23rd Mar 2026
- 9th & 23rd April
- 7th & 21st May

ACHIEVERS BATCH
(TARGET FOR 2027)

FOUNDATION BATCH
(TARGET FOR 2028)

- 9th Mar 2026

Scan QR for more Details:

Special Concessions Available
for **IITs / NITs / IIITs & Govt College students**

779996602 aceenggacademy.com

30. Which one of the following is NOT a step comprised in the completion of a project?
(a) Final inspection
(b) Defects liability period
(c) Maintenance retention sum
(d) Problem identification

30. Ans: (d)

Sol: Project completion includes activities carried out after execution to formally close the project and hand it over.

- **Final inspection:** Done to verify that the work meets required specifications before handover — part of completion.
- **Defects liability period:** Time after completion during which the contractor rectifies defects — part of closing/hand-over stage.
- **Maintenance retention sum:** Amount withheld to ensure maintenance and defect correction — related to completion.
- **Problem identification:** This is done during planning or execution phases, not at completion.

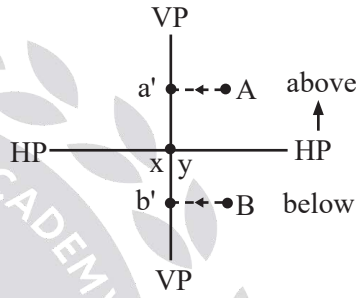
31. Consider the following statements regarding the projection of a point:
1. The line joining the top view and the front view of a point is always perpendicular to xy. It is called a reference line.
2. When a point is above the H.P., its front view is above xy; when it is below H.P., the front view is below xy.
3. When a point is in front of the V.P., its top view is below xy; when it is behind the V.P., the top view is above xy.
4. As the point is below the H.P. and behind the V.P., its front view will be above xy and the top view is below xy.

Which of the above statements are correct?
(a) 2 and 3 (b) 1 and 4
(c) 1 and 2 (d) 2 and 4

31. Ans: (a)

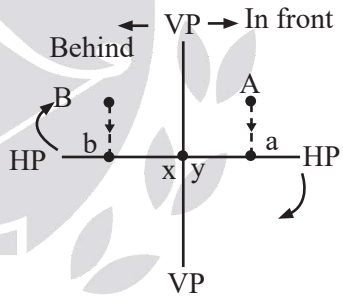
Sol: 1. Line joining TV and FV is always perpendicular to xy. It is called a projector line **(wrong)**

2.



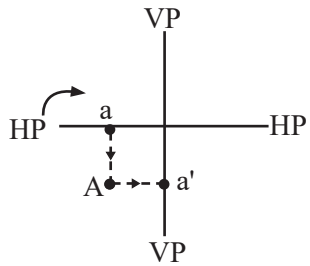
Correct

3.



Correct

4. When the point is below HP and behind the VP i.e it is in 3rd Quadrant.



It's FV is below xy and TV is above xy.

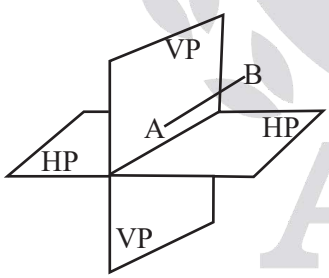
32. Consider the following statements regarding the traces of a line:
    1. When a line is parallel to the HP and the VP, it has no trace.
    2. When a line is inclined to HP and parallel to VP, it has only the VT but no HT.
    3. A line PQ is perpendicular to the HP. Its HT coincides with its top view which is a point. It has no VT.
    4. A line RS is perpendicular to the VP. Its VT coincides with its front view which is a point. It has no HT.

    Which of the following statements are correct?
    (a) 2, 3 and 4 (b) 1, 3 and 4
    (c) 1, 2 and 3 (d) 1, 2 and 4

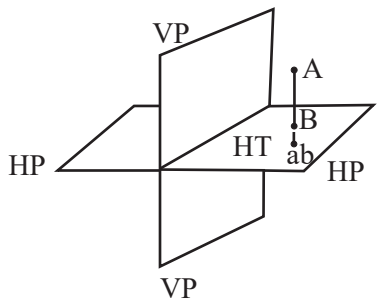
32. Ans: (b)

Sol: Trace of a line occur only when it is inclined or perpendicular to the reference plane

1. line parallel to both HP and VP, it has no trace (1) is correct.

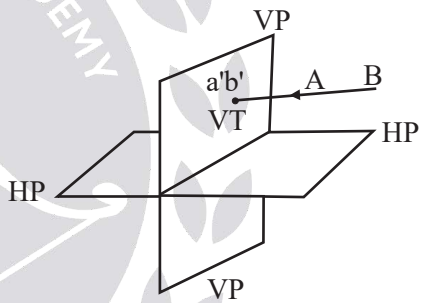


2. Since line is inclined to HP and parallel to VP. Only HT occurs but no VT (2) is wrong.
3. Since the line is perpendicular to HP → It has HT and it coincides with TV (3) is correct.



the line parallel to VP, No VT occurs (3) correct.

4. The line is parallel to HP, No HT occurs and it is perpendicular to VP –VT occurs and coincides with FV (4) is correct.



33. Consider the following statements regarding the projections of planes:
    1. When a plane is perpendicular to both the reference planes, its traces lie on a straight line perpendicular to xy.
    2. When a plane is perpendicular to a reference plane, its projection on that plane is a straight line.
    3. When a plane is parallel to a reference plane, its projection on that plane shows its reduced shape and size.
    4. When a plane is parallel to the VP, beginning should be made with the front view and the top view projected from it.

Which of the above statements are correct?

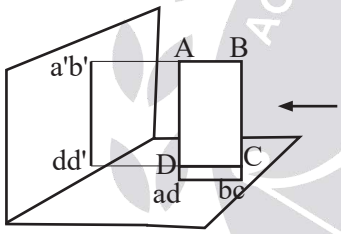
(a) 1, 3 and 4 (b) 2, 3 and 4

(c) 1, 2 and 3 (d) 1, 2 and 4

33. Ans: (d)

Sol:

1. when a plane is perpendicular to both the reference planer, then its true shape appears in side view and its front view and top view are straight lines where traces acts on it, perpendicular to xy (1) is correct.
2. when a plane is perpendicular to a reference plane, its projection on that plane is a straight line, i.e it appears in edge view (2) is correct.



3. (3) is Wrong
4. When a plane is parallel to the VP, then true shape of the plane appears in front view. so, draw the FV first then the top view is project from it (4) is correct.

34. Consider the following statements regarding projections of solids:

1. When the axis of a solid is perpendicular to a plane, its base will be parallel to that plane.
2. The projection of a solid on the plane to which its axis is perpendicular will show the true shape and size of its base.
3. When the axis is perpendicular to the top view should be drawn first and the front view projected from it.
4. A solid in simple position has its axis parallel to one reference plane and perpendicular to other.

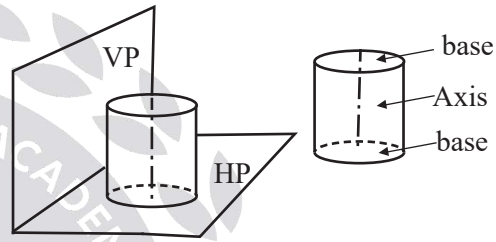
Which of the above statements are correct?

(a) 1, 2 and 3 (b) 2, 3 and 4

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

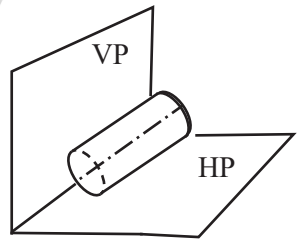
34. Ans: (a)

Sol:



In solids, axis and base are perpendicular.

1. If axis is perpendicular to the reference plane then its solid base will be parallel to that plane.
2. When axis of a solid is perpendicular to the reference plane then the projection (view) on that plane shows the true shape and size of the base.
3. In the above figure, if we observe, the axis is perpendicular the HP and parallel to VP. Top view show the base (circle) which is drawn first then its front view is projected from it.
4. In simple position the axis of the solids can be in



(i) axis parallel to one reference plane and perpendicular to other.

(ii) axis parallel to both the reference planes.

ACE® Engineering Academy
Since 1995
Leading Institute for ESE/GATE/PSUs

ace online
(A Digital Initiative by ACE Engineering Academy)

Exclusive ONLINE LIVE CLASSES

ESE | GATE PSUs

EC | EE | ME | CE | CS | DA

REGULAR BATCHES (ESE | GATE | PSUs-2027)

- 21st Feb, 2026
- 23rd Mar 2026
- 9th & 23rd April
- 7th & 21st May

ACHIEVERS BATCH (TARGET FOR 2027)

FOUNDATION BATCH (TARGET FOR 2028)

- 9th Mar 2026

Scan QR Code & Start your
7-DAY FREE TRIAL TODAY!

Special Concessions Available
for **IITs / NITs / IIITs & Govt. College students**

- Experienced Faculty
- Ask an Expert
- Live Doubt Clearance
- Learn with 2D & 3D Animations
- Free Online Test Series
- Full Set of Study Material
- 0% No Cost EMI

35. Match the following lists:

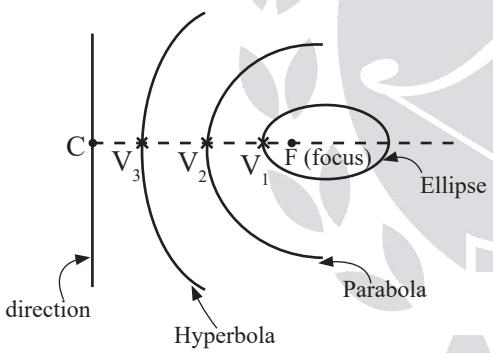
List I (Name of the curve)	List II (Eccentricity)
P. Hyperbola	1. $e > 1$
Q. Ellipse	2. $e = 1$
R. Parabola	3. $e < 1$

Select the correct answer using the code given below:

	P	Q	R
(a)	1	2	3
(b)	1	3	2
(c)	2	3	1
(d)	2	1	3

35. Ans: (b)

Sol: Eccentricity $(e) = \frac{\text{moving point distance from focus}}{\text{moving point distance from direction}}$



Here F – focus, V – vertex (moving piont) and c – a point direction.

Ellipse = $\frac{V_1F}{V_1C} < 1$

Parabola = $\frac{V_2F}{V_2C} = 1$

Hyperbola = $\frac{V_3F}{V_3C} > 1$

36. Which one of the following statements comes under process design?

(a) A tennis racket that returns the ball just as well when hit near the rim as when in dead centre

(b) A hospital operating room that maintains lighting and life support systems when electric power to the hospital is interrupted

(c) An airplane that flies as well in stormy weather as in clear weather

(d) A turbine operation that produces a good surface finish throughout a wide range of cutting speeds

36. Ans: (d)

Sol: Robust Design Principle

Robust design ensures consistent performance despite variations,

(a) Tennis racket -> Performs equally on rim or center – Robust Design in product design

(b) Hospital room -> Maintains lighting during power interruption – Reliability, but not robustness.

(c) Airplane -> Storms as well as clear weather – Again Reliability not Robustness

(d) Turning operation -> Good finish over wide speeds – Robust design in process design.

37. Which one of the following is used to show whether or not a characteristic or a property of the item complies with the stated specification under maintenance actions?

(a) Compliance test (b) Overhaul
(c) Monitoring (d) Rebuilding

37. Ans: (a)

Sol: **Definition**

A compliance test shows whether a characteristic or property of an item complies with the stated specification under maintenance actions.

Context in Maintenance

This test verifies conformity by measuring or gauging item properties against specs, distinct from general inspections.

Other Options

Overhaul: Comprehensive disassembly and repair, not specification verification.

Monitoring: Tracks changes over time, not direct compliance checking.

Rebuilding: Full reconstruction to original specs, beyond testing.

38. Action taken after maintenance actions to verify that the item is able to perform the required function is known as
(a) Fault diagnosis
(b) Turnaround maintenance
(c) Function check-out
(d) Modification

38. Ans: (c)

Sol: The correct answer is (c) Function check-out.

Definition

Action taken after maintenance to verify that the item can perform its required function is known as function check-out, a standard post-maintenance verification process.

Option Breakdown

Fault diagnosis: Identifies issues before or during maintenance, not verification after.

Turnaround maintenance: Planned shutdowns for comprehensive plant repairs, not item-specific post-maintenance checks.

Modification: Changes to design or components, unrelated to post-maintenance verification.

39. Consider the following statements regarding the maintenance of machineries:
1. Corrective maintenance actions are maintenance activities that are carried out after a failure has occurred.
2. Corrective maintenance must be initiated immediately to restore critical systems to their functional state or can be deferred to a more convenient time if failure is not critical and does not need immediate action.
3. Preventive maintenance must be initiated immediately to restore critical systems to their functional state or can be deferred if failure is not critical and does not need immediate action.

Which of the above statements are correct?
(a) 1 and 2 (b) 2 only (c) 1 only (d) 1 and 3

39. Ans: (a)

Sol: Statement 1 and 2 are correct.

Statement Breakdown

Statement 1 accurately defines corrective maintenance as activities carried out after a failure.

Statement 2 is Also correct: Corrective maintenance restores critical systems after failure occurs, taking priorities on critical systems over non-critical systems.

Statement 3 is incorrect: Preventive maintenance is scheduled routinely for critical systems to avert failures; non-critical systems often use run-to-failure (corrective) if immediate action isn't needed.

40. Which one of the following technologies is used to monitor condition of an object and to decide on maintenance based on the condition?
(a) Information and Communication Technology
(b) Sensor Technology

OFFLINE

ACE Engineering Academy
Since 1995
Leading Institute for ESE/GATE/PSUs

Classroom Coaching

- Engaging in classroom coaching provides a transformative and engaging learning experience that deeply encourages interactive student-faculty relationships within an ideal educational environment.
- By participating in our extensive classroom sessions, students not only acquire knowledge but also develop crucial skills and enhanced confidence levels that are pivotal for their success.
- ACE provides classroom coaching by experienced educators to support increased competition and participation in competitive exams.






→ ***Smart Classrooms*** → ***Library/Reading Rooms***

→ ***Calm Study Environment*** → ***Near to Metro Station***

→ ***Centralized AC Classrooms*** → ***No-Cost EMI available***

H.O. @ Abids # 3rd Floor, Suryalok Complex, Rosary Convent School Road, Gun Foundry, Basheer Bagh, Hyderabad, Telangana – 500001.

B.O. @ Kothapet # 2nd floor, BAHETI SPECTRUM, Beside: Kinara Grand, Near Victoria MemorialMetro Station, Pillar No: CHPNP-32, 33, Kothapet, Hyderabad, Telangana.

7799996602 ***www.aceenggacademy.com | www.ace.online***

(c) Transit Technology

(d) Risk Based Technology

40. Ans: (b)

Sol: **Sensor technology** is for monitoring an object's condition to guide maintenance decisions.

Why Sensors?

Sensors directly measure key parameters like vibration, temperature, pressure, and fluid levels on machinery or assets. This enables condition-based maintenance (CBM), where data reveals anomalies for proactive scheduling, unlike fixed timelines.

Other Options

(a) **Information and communication technology:** Handles data networks but doesn't perform the core sensing.

(c) **Transit Technology:** Relates to transportation, irrelevant here.

(d) **Risk based Technology:** Focuses on probability assessments, not real-time monitoring.

41. How many total number of lattice parameters are required to fully specify Rhombohedral crystal system?

(a) 2 (b) 3 (c) 4 (d) 6

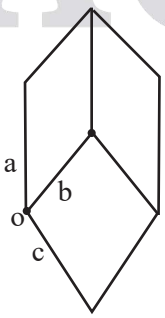
41. Ans: (a)

Sol: The primitive cell parameters for rhombohedral system is

$a = b = c$

$\alpha = \beta = \gamma \neq 90^o$

Two independent lattice parameters required to define a rhombohedral systems.



42. If a and c represent, respectively, the short and long unit cell dimensions for Hexagonal crystal, the ideal c/a ratio should be

(a) 1.433 (b) 1.633

(c) 2.833 (d) 4.533

42. Ans: (b)

Sol: From hexagonal closed packed (HCP) stucture

$a = 2R$

From Δ OAB

$OA = \frac{C}{2}, OB = a$

$OB^2 = OA^2 + AB^2$

$a^2 = \frac{c^2}{4} + AB^2$

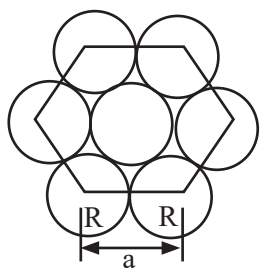
$a^2 = \frac{c^2}{4} + \frac{a^2}{3}$

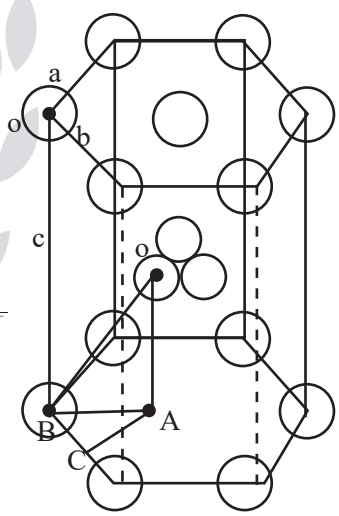
$\frac{c}{a} = \sqrt{\frac{8}{3}} = 1.634$

From Δ ABC

$\cos 30^o = \frac{\frac{a}{2}}{AB}$

$AB = \frac{\frac{a}{b}}{\cos 30^o} = \frac{\frac{a}{b}}{\sqrt{\frac{3}{2}}} = \frac{a}{\sqrt{3}}$





43. In characteristics of cubic crystal, the planes and directions having the same indices are always at the angle of

(a) 15° to one another

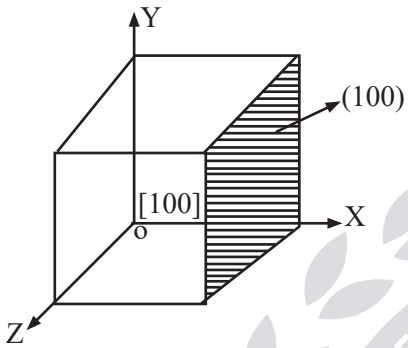
(b) 30° to one another

(c) 45° to one another

(d) 90° to one another

43. Ans: (d)

Sol: Let us consider a crystallographic direction [100] and crystallographic plane (100)



From the above direction and plane are $\perp^{er}$ to each other

44. Consider the following statements regarding Face Centered Cubic Crystal Structure:

1. There are eight corner atoms, six face atoms and no interior atoms; then the number of atoms per unit cell are 6.
2. Coordination number is 12.
3. Atomic packing factor is 0.74.
4. Volume of unit cell is $V = 16R^3\sqrt{2}$, where R is atomic radius.

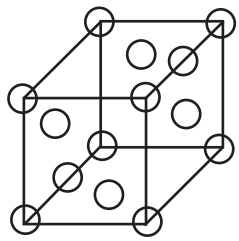
Which of the above statements are correct?

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

44. Ans: (c)

Sol: **Face Centered cubic structure**

There are eight comer atoms, six face atoms and no interior atoms,



The number of atoms per unit =

(a) – $n = \frac{1}{8}\times 8 + \frac{1}{2}\times 6 = 4$ atoms

(b) coordination number = 12

(c) Atomic packing factor = 0.74

(d) Volume of unit cell = $a^3 = \left(\frac{4R}{\sqrt{2}}\right)^3 = 16\sqrt{2}R^3$

45. In crystal materials, the equilibrium number of vacancies in crystalline solid increases

(a) linearly with temperature
(b) exponentially with temperature
(c) exponentially and then decreases with temperature
(d) linearly and then exponentially with temperature

45. Ans: (b)

Sol: In crystal materials, the equilibrium number of vacancies in crystalline solid increase exponentially with temperature

$h_v = N e^{\frac{-Ev}{KT}}$

n_v = number of vacancies /m^3

N = number of atoms /m^3

E_V = Energy required to vacate

K = Boltzmann constant

T = Temperature

46. Consider the following statements regarding quantum dots:
1. A photon's polarization can be vertical or horizontal, or a superposition of both, and we can use this as a qubit.
2. Neutral atoms can be trapped at low temperatures using a magneto-optical trap, which uses magnetic fields and lasers to cool and trap the atoms.
3. An electron can be bound to a small semiconductor device, similar to an electron bound to the nucleus of an atom. In these "artificial atoms", the spin of an electron, which can be "spin up" or "spin down", can be used as a qubit.

Which of the above statements is/are correct?
(a) 1 only (b) 2 only
(c) 3 only (d) 1, 2 and 3

46. Ans: (d)

Sol: Quantum dot:
1. Photon polarization is a clacical two level quantum system
→ Vertical
→ Horizontal
→ Superposition
2. Neutral atoms can be trapped at low temperatures using a magneto-optical trap (MoT)
3. An electron bound to a small semiconductor device can me its spin as a qubit.

47. Five routers are to be connected in a point-to-point subnet. Between each pair of routers, the designers may put a high-speed line, a medium-speed line, or no line. If it takes 100 ms of computer time to generate and inspect each topology, how long will it take to inspect all of them?
(Options given in seconds; values around 10^5 seconds)
(a) 108,578.6 sec (b) 102,785.6 sec
(c) 110,857.6 sec (d) 104,857.6 sec

47. Ans: (d)

Sol: Number of routers = 5
As it is point to point subnet mesh to pology

Number of point to point lines = $\frac{n(n-1)}{2}$

$= \frac{5(4)}{2} = 10$

$\Rightarrow$ of choices of lines, so number of topologies = 4^{10} = 1048576
$\Rightarrow$ each topology takes 100 units
$\therefore$ inspection time = 1048576 × 100
= 104857600 ms (or) 104857.6 sec

48. A group of N stations share a 56-kbps pure ALOHA channel. Each station outputs a 1000-bit frame on average once every 100 sec, even if the previous one has not yet been sent (e.g., the stations can buffer outgoing frames). What is the maximum value of N?
(a) 1003 stations (b) 1100 stations
(c) 1010 stations (d) 1030 stations

48. Ans: (d)

Sol: The maximum throughput for pure Aloha is 18.4% ie 0.184.
Therefore Usable Channel Rate = 0.184 * 56 kbps
= 10.3 kbps.
Bits per second outputted by each station

$= \frac{1000 \text{ bits}}{100 \text{ sec}} = 10 \text{ bps}.$

N station outputs 10 bps on a channel which has the usable channel rate of 10.3 kbps. Therefore,

$N = \frac{10.3 * 10^3}{10} = 1030$ stations

ACE Interview Guidance Program

Empowering Job Seekers to Succeed

- Job seekers confront a variety of challenges on their path to securing a job. Our ACE Interview Guidance programme has been carefully designed to provide thorough assistance in overcoming these challenges.
- With a team of seasoned experts at the helm, our focus is on empowering individuals with the intricate skills and extensive knowledge required to fully shine during interviews.
- Whether it's perfecting your presentation strategies or fine-tuning your overall interview skills, we are completely committed to improving your prospects of securing desired positions.
- ACE conducts comprehensive mock interviews with expert panel members, both in person and virtually. These simulations are designed to thoroughly prepare individuals for college admissions or job interviews.

 # ACE YOUR INTERVIEWS WITH OUR EXPERT GUIDANCE!

Our Social Links

aceonlineprep | aceonlineprep | aceonline

@aceengacademy | aceacademyindia_official

$\therefore$ In pure alone, max throughput = 0.184 or 184%

usable B and width = 0.184 × 56 Kbps

= 10.3 Kbps

$\therefore$ load per station = $\frac{1000}{100}$ = 10 bits

$\therefore$ N = $\frac{10.3\times1000}{10} = \frac{10300}{10} = 1030$.

49. Which one of the following protocols is suitable for IoT communication that though it was originally designed to support IEEE 802.15.4 low-power wireless networks in the 2.4-GHz band?

(a) Routing Protocol for Low power and Lossy networks (RPL)

(b) IPv4/IPv6 (c) 6LoWPAN (d) MQTT

49. Ans: (c)

Sol: 6LoWPAN stands for: IPv6 over Low-Power Wireless Personal Area Networks. It was specifically designed to allow IPv6 communication over:

- IEEE 802.15.4
- Low-power devices.
- Short-range wireless networks.
- IoT environments

The question literally describes the purpose of 6LoWPAN.

50. Which one of the following statements is related to key feature of Threat Radar reputation to prevent DDoS attacks on cloud infrastructure?

(a) Threat Radar reputation service keeps track of users who are attacking other websites; by using this information, it will filter off any request from those users and prevent them from getting into the cloud system

(b) ThreatRadar reputation service helps to monitor and keep track of both user agents and DDoS attacks vectors

(c) Threat Radar reputation service helps to detect users who have the pattern of generating and sending HTTP requests with long response times

(d) Threat Radar reputation service has the capability to send a JavaScript Challenge to users' browsers. The JavaScript challenge has the capacity to detect and block bots

50. Ans: (a)

Sol: The keyword here is **"reputation."**

A reputation-based security system works by:

- Maintaining a **database of malicious IPs/ users**
- Identifying attackers based on past behavior
- **Blocking requests before they reach the infrastructure**

This is a **primary DDoS prevention strategy** — stopping bad traffic at the edge.

All other options are not answers because

(b) Monitoring is useful, but reputation is mainly about blocking known attackers, not just tracking.

(c) Describes behavioral detection (slow HTTP attacks), not reputation.

(d) JavaScript challenges relate more to bot detection / challenge-response, not specifically reputation.

51. What is the name of the initiative launched by India and Denmark in November 2025 to enhance bilateral ties?

(a) Indo-Danish Economic Forum

(b) India-Denmark Trade Partnership

(c) Indo-Danish Business Council

(d) India-Denmark Sustainability Initiative

51. Ans: (c)

Sol: India and Denmark launched the Indo-Danish Business Council (IDBC) in November 2025 in Copenhagen to strengthen bilateral ties and promote strategic business cooperation. Building on the India-Denmark Green Strategic Partnership, the council focuses on innovation, entrepreneurship, and green and digital transitions, bringing together industry leaders, investors, and policymakers.

52. Which Ministry released the India AI Governance Guidelines in 2025?
(a) Ministry of Science and Technology
(b) Ministry of Electronics and Information Technology
(c) Ministry of Corporate Affairs
(d) Ministry of Education

52. Ans: (b)

Sol: The Ministry of Electronics and Information Technology (MeitY), under the IndiaAI Mission, today unveiled the India AI Governance Guidelines, a comprehensive framework to ensure safe, inclusive, and responsible AI adoption across sectors.

53. Which organization developed the Online National Drugs Licensing System (ONDLS) portal?
(a) Centre for Development of Advanced Computing (CDAC)
(b) National Health Authority (NHA)
(c) Indian Pharmacopoeia Commission (IPC)
(d) Drug Controller General of India

53. Ans: (a)

Sol: It is a digital single-window platform for processing various drug-related licences in India, developed by Centre for Development of Advanced Computing(CDAC) in coordination with CDSCO, the Directorate General of Health Services, the Ministry of Health and Family Welfare, and State/UT Drug Regulatory Authorities. The platform aims to ensure a uniform, transparent, and accountable drug-licensing process across the country and facilitates applications for manufacturing and sales licences, blood bank licences, and certificates such as COPP, GMP, WHO-GMP, Market Standing Certificate, as well as post-approval changes.

54. Which institution released the report titled "India's Blue Economy: Strategy for Harnessing Deep-Sea and Offshore Fisheries"?
(a) Indian Council of Agricultural Research (ICAR)
(b) NITI Aayog
(c) Ministry of Earth Sciences
(d) Reserve Bank of India

54. Ans: (b)

55. The NE-SPARKS programme has been launched to promote awareness about which field among students of North Eastern Region of India?
(a) Renewable Energy
(b) Space Science and Technology
(c) Digital literacy
(d) Agriculture

55. Ans: (b)

Sol: NE-SPARKS stands for North East Students' Programme for Awareness, Reach and Knowledge on Space. It is an initiative aimed at creating awareness about space science and technology among students in India's North-Eastern region. The programme encourages scientific curiosity, promotes learning about space missions and applications, and motivates students to pursue

careers in science and research. Through workshops, interactions with scientists, and educational outreach, it highlights how space technology contributes to communication, weather forecasting, and national development.

56. Which space organization launched the PUNCH Space Mission?
(a) Indian Space Research Organisation (ISRO)
(b) National Aeronautics and Space Administration (NASA)
(c) European Space Agency (ESA)
(d) China National Space Administration (CNSA)

56. Ans: (b)

Sol: The PUNCH (Polarimeter to Unify the Corona and Heliosphere) mission is launched by NASA to study the Sun's outer atmosphere and its transition into the solar wind. The mission uses a group of small satellites to observe how solar material moves through space and affects the solar system. Its findings help scientists better understand space weather and its impact on Earth's communication and satellite systems.

57. According to Environmental Accounting report 2025, which state showed the highest rise in Recorded Forest Area (RFA) share?
(a) Chhattisgarh (b) Odisha
(c) Jharkhand (d) Uttarakhand

57. Ans: (d)

Sol: Environment accounting of forests report 2025: The report is released by Ministry of Statistics and Programme Implementation (MoSPI).

Major highlights:

- Physical Asset Account: India's forest cover increased by 17,444.61 sq km (22.5%) from 2010-11 to 2021-22, reaching 7.15 lakh sq km (21.76% of geographical area).
- Highest forest cover gains were recorded in Kerala, Karnataka, and Tamil Nadu.
- Extent Account: Forest extent showed a net increase of 3,356 sq km (2013–2023) mainly due to reclassification and boundary adjustments.
- Top states in Recorded Forest Area (RFA) growth are Uttarakhand, Odisha, and Jharkhand.
- Condition Account: Evaluates forest ecosystem quality using growing stock as a key indicator.
- Growing stock increased by 305.53 million cubic metres (7.32%) during 2013–23.
- Major contributors to growing stock growth include Madhya Pradesh, Chhattisgarh, and Telangana.

58. Where were the Fast Patrol Vessels (FPVs) ICGS Ajit and ICGS Aparajit launched?
(a) Cochin Shipyard Limited
(b) Mazagon Dock Shipbuilders
(c) Goa Shipyard Limited
(d) Hindustan Shipyard

58. Ans: (c)

Sol: The Indian Coast Guard (ICG) marked a significant milestone in strengthening India's maritime security with the launch of two advanced Fast Patrol Vessels (FPVs) ICG Ship Ajit and ICGS Aparajit at Goa Shipyard Limited (GSL) on October 24, 2025. These vessels are the seventh and eighth in a series of eight indigenously built FPVs being constructed by GSL for the ICG, marking an important step forward in enhancing the nation's coastal surveillance and response capabilities.

ONLINE

ace online

PROGRAMMES OFFERED

Self-Paced Learning Program

Immerse yourself in a personalized and enriching learning experience, with high-quality video content delivered by India's most esteemed and highly accomplished faculty members.

Enjoy the freedom of unlimited access, allowing you to study at your convenience from any location. Take advantage of complimentary live doubt clearing sessions and an extensive online test series to elevate your exam readiness.

LIVE

Exclusive Online Live Classes

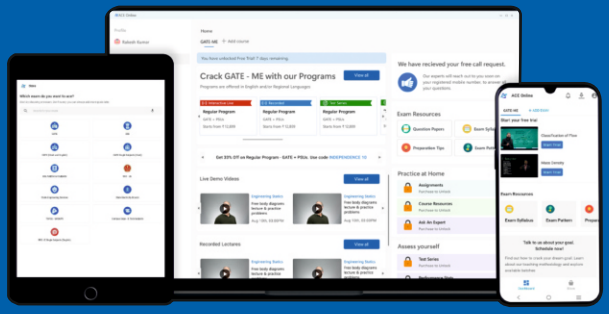
Engage in our exclusive live classes, offering an interactive learning experience from any location nationwide. Benefit from real-time guidance and the opportunity to resolve doubts directly with our esteemed faculty. Additionally, access recorded videos of the live sessions for convenient review before exams or to catch up on missed classes at your own pace.

0% No-Cost EMI Available

ESE | GATE | PSUs | SSC | RRB & 30+ Other Exams

Streams: CE | ME | EE | EC | CS | IN | DA

- Experienced Faculty
- Ask an Expert
- Live Doubt Clearance
- Learn with 2D & 3D Animations
- Free Online Test Series
- Full Set of Study Material



Scan QR & start your **7-DAY Free Trial!**

Download on the App Store | Get it on Google play | Download on the Windows Store

59. What is the theme of Global Media and Information Literacy (MIL) Week 2025?
(a) Empowering Citizens through Media Literacy
(b) Media Literacy for Peaceful Societies
(c) Building Critical Thinkers in the Digital Age
(d) Minds Over Artificial Intelligence in Digital Spaces

59. Ans: (d)

Sol: Commemorated every year on 24 – 31 October, Global Media and Information Literacy Week is a major occasion for mobilizing worldwide stakeholders to raise awareness, increase national take-up and celebrate the progress achieved towards Media and Information Literacy for all.

Theme of Global MIL Week 2025: "Minds Over AI - MIL in Digital Spaces".

This year's Global Media and Information Literacy Week Conference will be hosted by UNESCO and the Republic of Colombia on 23 and 24 October 2025 in Cartagena de Indias, Colombia. It will focus on the intersections of media and information literacy (MIL) and artificial intelligence (AI), exploring how AI is reshaping the information landscape and how MIL is crucial to empower individuals to critically engage with AI-driven content.

60. The Samriddh Gram Physical Services Pilot Project was recently launched by which organization?
(a) Telecom Regulatory Authority of India (TRAI)
(b) Bharat Sanchar Nigam Limited (BSNL)
(c) Telecom Centres of Excellence (TCoE)
(d) Ministry of Power

60. Ans: (c)

Sol: Telecom Centres of Excellence (TCoE) has signed Agreements with leading implementation partners - Digital Empowerment Foundation (DEF) in Ari & Umri in Madhya Pradesh, I-Novate Infotech Private Limited in Chaurawala, Uttar Pradesh and Corpus Enterprises Private Limited in Narakoduru, Andhra Pradesh. - to roll out the Samriddh Gram Phygital Services Pilot, aimed at transforming rural India through a seamless integration of physical and digital services leveraging BharatNet Infrastructure. The Samriddh Gram Phygital Services Pilot is envisaged as a pioneering phygital (physical + digital) Services model integrating on-ground presence with robust digital infrastructure to empower rural citizens. The initiative leverages BharatNet connectivity to deliver essential services seamlessly and sustainably, ensuring that every rural citizen benefits from digital transformation in daily life. DoT has identified three villages in which the pilot will be carried out. The identified villages are Ari & Umri in Madhya Pradesh, Narakoduru in Andhra Pradesh, and Chaurawala in Uttar Pradesh. Each village will host a Samriddhi Kendra which will serve as an integrated digital service hub.

61. A statement is given followed by three courses of action numbered 1, 2 and 3. Analyze the statement and decide which of the three courses of action logically follows and answer according to the alternative answers given along with the question.
Statement: The army has been alerted in the district following floods triggered by incessant rains.
Courses of action:
1. Relief to flood affected people should be arranged.
2. Supply of food articles should be arranged.
3. Adequate medical facilities should be arranged.

(a) Only 1 follows (b) Only 2 follows
(c) Only 1 and 3 follow (d) All follow

61. Ans: (d)

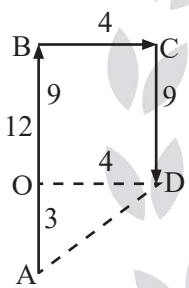
Sol: All the three follow.

62. Ramesh starts walking from point 'A'. He walks 12 km towards North from there he turns right and walks 4 km, then he again turns right and walks 9 km. How far and which direction he is from his starting point?

(a) 13 km East (b) 13 km South
(c) 5 km North (d) 5 km North-East

62. Ans: (d)

Sol:



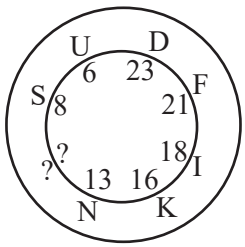
$AD^2 = AO^2 + OD^2$

$= 3^2 + 4^2$

$= 25$

$AD = \sqrt{25} = 5$

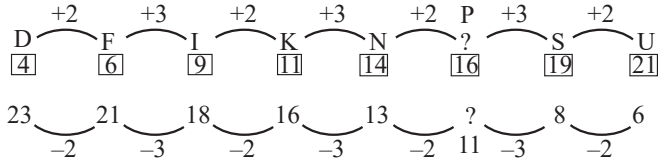
63. Indicate what will be the letter/numerical in the missing portion:



(a) R/9 (b) P/11 (c) Q/13 (d) P/16

63. Ans: (b)

Sol:



64. The question below you will find, instead of two pairs of words with more or less similar relationships between the first two words and the last two words, only first and fourth words are given and the second and third words are replaced by numbers 1 and 2, for each of which four alternatives marked E, F, G, H and P, Q, R, S, respectively. Study the alternatives carefully and choose the best answer.

Onomatology : 1 :: 2 : Language

1. (E) Names (F) Races (G) Reality (H) Insects
2. (P) Occultism (Q) Semantics (R) Concology (S) Ontology

(a) FS (b) EQ (c) GP (d) HR

64. Ans: (b)

Sol: Onomatology : **Names**

Semantics : Languages

Onomatology is the study of formation and history at names

Semantics is the branch of linguistics concerned with meaning in language.

65. A solid figure is given followed by a surface problem. Each surface of the solid figure (marked with 1, 2, 3, 4, 5, 6, etc.) corresponds to certain specific surface of the given problem. Your task will be to find out how it corresponds.

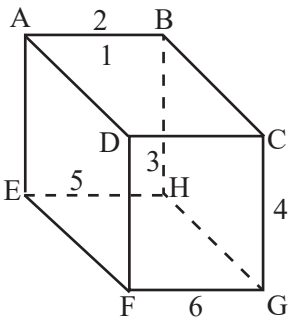


Figure-1

1. refers to the surface A B H E
2. refers to the surface A B C D
3. refers to the surface C D F G
4. refers to the surface B C G H
5. refers to the surface A D F E
6. refers to the surface E F G H

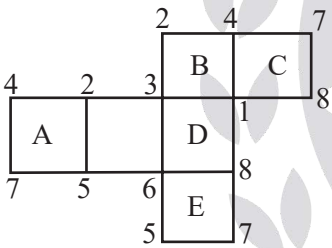


Figure-2

If surfaces B and D in figure 1 correspond to surfaces 1 and 3 respectively in key figure 2, then the points marked as 5 in figure 1 correspond to which point in the key figure 2?

(a) E (b) F (c) G (d) D

65. Ans: (*)

66. What is the name of the national digital framework launched at India Maritime Week 2025 to make Indian ports data-driven and AI-enabled?

(a) SmartPort Bharat (b) Sagarmitra
(c) Digi Bandar (d) PortNet India

66. Ans: (c)

Sol: Digit Bandar is a national digital framework for Indian ports, launched during India Maritime Week 2025, aimed at making ports data-driven, AI-enabled, and interconnected. It focuses on predictive logistics, digital twins, and automation to improve efficiency, safety, and transparency, supporting the digital transformation of India's maritime sector.

67. According to the Reserve Bank of India's report, which two countries together account for over one-third of the total FDI in India?

(a) United States and Singapore
(b) Mauritius and United Kingdom
(c) Singapore and Netherlands
(d) Japan and Germany

67. Ans: (a)

Sol: According to the Reserve Bank of India's 2024-25 provisional report on Foreign Liabilities and Assets (FLA), the United States and Singapore together accounted for over one-third of the total Foreign Direct Investment (FDI) in India. The U.S. was the largest source (approx. 20%), while Singapore held a 14.3% share.

68. Which organization is responsible for implementing the National Beekeeping & Honey Mission (NBHM)?

(a) National Horticulture Board (NHB)
(b) National Bee Board (NBB)
(c) National Cooperative Development Corporation (NCDC)
(d) Agricultural and Processed Food Products Export Development Authority (APEDA)

ACE Engineering Academy
Leading Institute for ESE/GATE/PSUs
Since 1995

ace online

RRB-JE 2025

MEGA MOCK TEST

CBT - I Common for all Streams

16th Feb, 2026

ONLINE | English | 11:00 AM - 12:30 PM

Scan QR to Register

---

ace online

ACE Engineering Academy
Leading Institute for ESE/GATE/PSUs
Since 1995

TGPSC/APPSC - AEE

Civil Engneering

Classroom Coaching Abids, Hyd

Online Live Classes

New Batches Starts from:

11th FEB 2026 **21st FEB 2026**

Concessions for:

- Early Bird Offer – **10% Discount** before 10th Feb

68. Ans: (b)

Sol: National Beekeeping and Honey Mission (NBHM) is a Central Sector Scheme for promoting scientific beekeeping for holistic growth of beekeeping sector. The goal is to bring about a "Sweet Revolution". The mission has a total budget outlay of Rs. 500 crores and is being implemented for the period FY 2020-21 to FY 2025-26. National Bee Board (NBB) is implementing the NBHM. NBHM is implemented through 3 Mini Missions that focus on productivity improvement, post-harvest management, and research & technology generation.

In 2024, India produced approx. 1.4 lakh metric tonnes (MT) of natural honey. India exported around 1.07 lakh metric tonnes (MT) of natural honey worth USD 177.55 million in FY 2023-24. It is now the second-largest exporter of honey globally, up from the 9th rank in 2020. The Madhukranti portal has been launched for the online registration and traceability of the source of honey and other bee products.

69. Laokhowa Wildlife Sanctuary is located in which state?

(a) Sikkim (b) Arunachal Pradesh
(c) Assam (d) Manipur

69. Ans: (c)

70. Which state is home to India's first Silicon Carbide (SiC) semiconductor manufacturing plant?

(a) Odisha (b) Jharkhand
(c) Bihar (d) Haryana

70. Ans: (a)

71. What is the expectation of the number of failures preceding the first success in an infinite series of independent trials with constant probability p of success in each trial?

(a) $\frac{q}{p^2}$ (b) $\frac{q}{p}$
(c) $\frac{q}{1+p}$ (d) $\frac{1}{1-q}$

71. Ans: (b)

Sol: X = Number of failures = {0, 1, 2, 3, ...}

X	0	1	2	3	.....
P(x)	p	qp	q^2p	q^3p	.....

$E(x) = \exp(x)$

$= qp\left(1 + 2q + 3q^2 + ...\right)$

$= qp\frac{1}{(1-2)^2} = \frac{qp}{p^2} == \frac{q}{p}$

72. A deck of n numbered cards is thoroughly shuffled and the cards are inserted into n numbered cells one by one. If the card number i falls in the cell i, we count it as a match, otherwise not, then what is the variance of total number of such matches?

(a) 1 (b) 0 (c) $\frac{1}{2}$ (d) $\frac{3}{4}$

72. Ans: (a)

Sol: (card)

Let $X_i = \begin{cases} 1 \text{ if number i matches to cell i} \\ 0 : \text{other wise} \end{cases}$

put $X = X_1 + X_2 + ...+ X_n$

$P(X_i = 1) = \frac{1}{n}$

$P(X_i) = 1 \cdot \frac{1}{n} = \frac{1}{n}$

Now $E(X) = \frac{1}{n} + \frac{1}{n} + ... + \frac{1}{n} = 1$

$$\text{Now } V(X) = \Sigma V(X_i) + 2(n_{c_2})\text{cov}(X_i, X_j)$$

$$= \Sigma V(X_i) + 2\frac{n(n-1)}{2}\left[E(X_i X_j)^{(j\neq j)} - E(X).E(X_j)\right]$$

$$= n\left[\frac{1}{n}\left(1-\frac{1}{n}\right)\right] + n(n-1)\left(\frac{1}{n(n-1)} - \left(\frac{1}{n}\right)^2\right)$$

$$= \left(\frac{n-1}{n}\right) + n(n-1)\left[\frac{n-(n-1)}{n^2(n-1)}\right]$$

$$= 1$$

73. Let X_1 and X_2 be two independent random variables having variances k and 4 respectively. If the variance of $Y = 3X_2 - X_1$ is 49, then what is the value of k?

(a) 7 (b) 13 (c) 9 (d) 11

73. Ans: (b)

Sol: $V(Y) = V(3X_2 - X_1)$

$= 9V(X_2) + 1V(X_1)$

$= 9 \times 4 + 1 \times K$

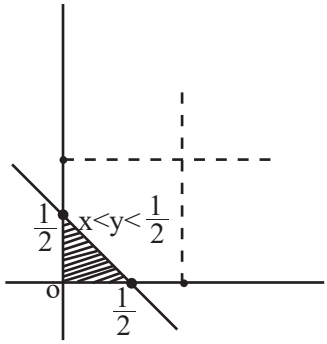
$49 = 36 + K \quad \therefore \quad K = 13$

74. What is the value of $P(X + Y < \frac{1}{2})$ for the joint probability density function of X and Y $f(x, y) = 3(x + y); 0 \le x \le 1, 0 \le y \le 1; 0 \le x + y \le 1$?

(a) $\frac{1}{16}$ (b) $\frac{1}{8}$ (c) $\frac{1}{12}$ (d) $\frac{1}{7}$

74. Ans: (b)

Sol:



$$P(X + Y < \frac{1}{2}) = \int_{x=0}^{\frac{1}{2}} \int_{y=0}^{\frac{1}{2}-x} 3(x+y)\,dy\,dx$$

$$= \int_{x=0}^{\frac{1}{2}} \left(3xy + \frac{3y^2}{2}\right)_0^{\frac{1}{2}-x} dx = \int_0^{\frac{1}{2}} 3x\left(\frac{1}{2}x\right)dx + \int_0^{\frac{1}{2}} \frac{3}{2}\left(\frac{1}{2}-x\right)^2 dx$$

$$= \frac{3}{4}(x^2)_0^{\frac{1}{2}} - \frac{3}{3}(x^3)_0^{\frac{1}{2}} + \frac{3}{2}\left[\frac{1}{4}x + \frac{x^3}{3} - \frac{x^2}{2}\right]_0^{\frac{1}{2}}$$

$$= \frac{3}{4}\left(\frac{1}{4}\right) - \left(\frac{1}{8}\right) + \frac{3}{2}\left[\frac{1}{8} + \frac{1}{24} - \frac{1}{8}\right]$$

$$= \left(\frac{3}{16} - \frac{1}{8} + \frac{3}{48}\right) = \frac{9-6+3}{48}$$

$$= \frac{6}{48} = \frac{1}{8}$$

75. What is the value of $\int_0^6 \frac{1}{1+3x+x^2}dx$ by applying Simpson's $3/8^{th}$ rule by taking h = 1?

(a) 0.8145 (b) 0.0295

(c) 0.5215 (d) 0.6315

75. Ans: (a)

Sol:

Let $\int_a^b f(x)dx = \int_0^6 \frac{1}{1+3x+x^2}dx$ & h = 1

then a = 0, b = 6, & $f(x) = \frac{1}{1+3x+x^2}$

$x = x_i$	$x_0 = 0$	$x_1 = 1$	$x_2 = 2$	$x_3 = 3$	$x_4 = 4$	$x_5 = 5$	$x_6 = 6$
$y_i = f(x_i) = \frac{1}{1 + 3x_i + x_i^2}$	$y_0 = 1$	$y_1 = 0.2 = \frac{1}{5}$	$y_2 = \frac{1}{11} = 0.0909$	$y_3 = \frac{1}{19} = 0.0526$	$y_4 = \frac{1}{29} = 0.0344$	$y_5 = \frac{1}{41} = 0.0243$	$y_6 = \frac{1}{55} = 0.0181$

The formula of Simpson's $\frac{3}{8}^{th}$ is

$$I = \int_a^b f(x)dx \simeq \int_a^b p(x)dx = \frac{3h}{8}\left[(y_0 + y_6) + 2(y_3) + 3(y_1 + y_2 + y_4 + y_5)\right]$$

$$\Rightarrow \quad I = \int_a^b f(x)dx \simeq \int_a^b p(x)dx = \frac{3}{8}\left[(1 + 0.0181) + 2(0.0526) + 3(0.2 + 0.0909 + 0.0344 + 0.0243)\right]$$

$$\Rightarrow \quad I = \int_a^b f(x)dx \simeq \int_a^b p(x)dx = \frac{3}{8}\left[(1.0181) + (0.1052) + 3(0.3496)\right]$$

$$I = \int_a^b f(x)dx \simeq \int_a^b p(x)dx = \frac{3}{8}[1.0181 + 0.1052 + 1.0488]$$

$$= \frac{3}{8}[2.1721]$$

$$= 0.8145$$

76. If y_x is a polynomial for which fifth difference is constant and $y_1 + y_7 = -496$, $y_2 + y_6 = 334$, $y_3 + y_5 = 962$, then what is the value of y_4 ?

(a) 571.25 (b) 536.75 (c) 596.50 (d) 597.25

76. Ans: (c)

Sol: Given that $y_1 + y_7 = 496$

$y_2 + y_6 = 334$

$y_3 + y_5 = 962$

Also given that 5^{th} order difference is constant

$\Rightarrow$ 6^{th} order difference is zero

i.e $\Delta^6 y_1 = 0$

$\Rightarrow$ $(E - 1)^6 y_1 = 0$, where $\Delta = E - 1$

$\Rightarrow$ $(E^6 - 6E^5 + 15E^4 - 20E^3 + 15E^2 - 6E + 1) y_1 = 0$

$\Rightarrow$ $E^6 y_1 - 6E^5 y_1 + 15E^4 y_1 - 20E^3 y_1 + 15E^2 y_1 - 6Ey_1 + y_1 = 0$

$\Rightarrow \quad y_7 - 6y_6 + 15y_5 - 20y_4 + 15y_3 - 6y_2 + y_1 = 0$

$\left(\because E^k_{y_n} = y_{n+k}\right)$

$\Rightarrow \quad (y_1 + y_7) - 6(y_2 + y_6) + 15(y_3 + y_5) - 20\, y_4 = 0$

$\Rightarrow \quad (-496) - 6(334) + 15(962) - 20\, y_4 = 0$

$\Rightarrow \quad 20\, y_4 = -496 - 2004 + 14430 = 11930$

$\therefore \; y_4 = 596.5$

77. An unbiased coin is thrown n times. It is desired that the relative frequency of the appearance of heads should lie between 0.49 and 0.51. What is the smallest approximate value of n that will ensure this result with 90% confidence (z = 1.645)?

(a) 5648 (b) 6765

(c) 4989 (d) 8785

77. Ans: (b)

Sol: We want the relative frequency P to lie between 0.49 to 0051 with 90% confidence 90 the maximum allowable error is

$E = 0.01$

$\Rightarrow$ Margin of error ≤ 0.01

$$z\sqrt{\frac{P(1-P)}{n}} \le 0.01$$

$P = 0.5$ (unbiased coin)

For 90% confidence level $Z = 1.645$

$$(1.645)\sqrt{\frac{0.5(1-0.5)}{n}} \le 0.01$$

$\Rightarrow \quad \sqrt{n} \ge 82.25 \Rightarrow n \ge 6765.06$

78. The value of integral

$$\int_0^{\sqrt{2}} \int_{-\sqrt{4-2y^2}}^{\sqrt{4-2y^2}} y \, dx \, dy \text{ is}$$

(a) $\frac{3}{8}$ (b) $\frac{8}{3}$ (c) $\frac{5}{8}$ (d) $\frac{8}{5}$

78. Ans: (b)

Sol: Let $I = \int_{y=0}^{\sqrt{2}} \left[\int_{x=-\sqrt{4-2y^2}}^{\sqrt{4-2y^2}} y \, dx\right] dy$

Then $I = \int_{y=0}^{\sqrt{2}} y\left[2\int_0^{\sqrt{4-2y^2}} dx\right] dy$

$\Rightarrow \quad I = 2\int_{y=0}^{\sqrt{2}} y(x)_0^{\sqrt{4-2y^2}}\, dy$

$\Rightarrow \quad I = 2\int_{y=0}^{\sqrt{2}} y\left[\sqrt{4-2y^2} - 0\right] dy$

$\Rightarrow \quad I = \left(\frac{1}{-2}\right)\int_{y=0}^{\sqrt{2}} (-4y)\left(4-2y^2\right)^{\frac{1}{2}} dy$

$\Rightarrow \quad I = \left(\frac{1}{-2}\right)\left[\frac{\left(4-2y^2\right)^{\frac{1}{2}+1}}{\frac{1}{2}+1}\right]_0^{\sqrt{2}}$

$\Rightarrow \quad I = \frac{-1}{3}\left[\{4-2(2)\}^{\frac{3}{2}} - (4-0)^{\frac{3}{2}}\right]$

$\Rightarrow \quad I = \left(\frac{-1}{3}\right)\left[0-(2)^3\right]$

$\therefore \quad I = \frac{8}{3}$

79. What is the value of

$$\int_0^a \int_{\frac{y^2}{a}}^{y} \frac{y}{(a-x)\sqrt{ax-y^2}} dx \, dy$$

by changing the order of integration?

(a) $\frac{3\pi a}{2}$ (b) $\frac{5\pi a}{4}$ (c) $\frac{\pi a}{2}$ (d) $\frac{\pi a}{4}$

ACE Engineering Academy

ace online

SSC JE / RRB JE-2026

(Prelims & Mains) GS & Tech.

Civil Engineering

Classroom Coaching @ Abids, Hyd

Online Live Classes

21ST FEB, 2026

Scan QR code to Register

ACE Engineering Academy | ace online

AP & TG

TRANSCO, GENCO, DISCOMs

New Batches for **Electrical Engineering (EE)**

Classroom Coaching

Strats from:

9th Feb, 2026

21st Feb, 2026

@ Abids, Hyderabad

Online Live Classes

Strats from:

9th Feb, 2026

21st Feb, 2026

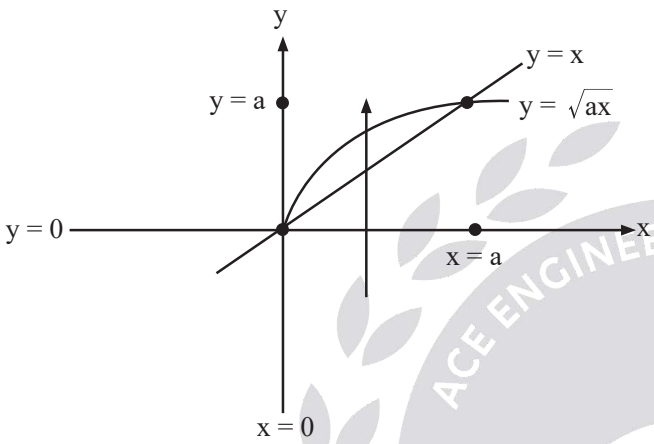
SPECIAL DISCOUNTS AVAILABLE

Register Now

79. Ans: (c)

Sol:

$$\text{Let } I = \int_{y=0}^{a}\left[\int_{x=\frac{y^2}{a}}^{y}\frac{y}{(a-x)\sqrt{ax-y^2}}dx\right]dy$$



After changing the order of integration,

x : 0 to a

y : x to $\sqrt{ax}$

$$\text{Now, } I = \int_{x=0}^{a}\left[\int_{y=x}^{\sqrt{ax}}\frac{y}{(a-x)(ax-y^2)^{\frac{1}{2}}}dy\right]dx$$

$$\Rightarrow I = \int_{x=0}^{a}\left[\frac{1}{-2(a-x)}\int_{y=x}^{\sqrt{ax}}(-2y)(ax-y^2)^{\frac{1}{2}}dy\right]dx$$

$$\Rightarrow I = \int_{x=0}^{a}\frac{1}{-2(a-x)}\left[\frac{(ax-y^2)^{\frac{-1}{2}+1}}{\frac{-1}{2}+1}\right]_{x}^{\sqrt{ax}}dx$$

$$\Rightarrow I = \int_{x=0}^{a}\frac{1}{(a-x)}\left[(ax-x^2)^{\frac{1}{2}}-(ax-ax)^{\frac{1}{2}}\right]dx$$

$$\Rightarrow I = \int_{x=0}^{a}\frac{\sqrt{x}(a-x)^{\frac{1}{2}}}{(a-x)}dx$$

$$\Rightarrow I = \int_{x=0}^{a}\sqrt{x}\frac{1}{\sqrt{a-x}}dx$$

Consider $x = a\sin^2\theta$

$\Rightarrow dx = 2a\sin\theta.\cos\theta\, d\theta = a\sin(2\theta)\, d\theta$

Here for $x = 0$, $\theta = \theta$

and for $x = a$, $\theta = \frac{\pi}{2}$

$$\text{Now, } I = \int_{\theta=0}^{\frac{\pi}{2}}\frac{\sqrt{a\sin^2\theta}}{a-a\sin^2\theta}2a.\sin\theta.\cos\theta\, d\theta$$

$$\Rightarrow I = \int_{\theta=0}^{\frac{\pi}{2}}\frac{a^{\frac{3}{2}}.\sin\theta.2.\sin\theta.\cos\theta}{\sqrt{a}.\cos(\theta)}d\theta$$

$$\Rightarrow I = (a)(2)\int_{\theta=0}^{\frac{\pi}{2}}\sin^2(\theta)d\theta$$

$$\Rightarrow I = (2a)\left[\left(\frac{1}{2}\right)\left(\frac{\pi}{2}\right)\right]$$

$$\therefore I = \frac{a\pi}{2}$$

80. What is the value of

$$\int_{0}^{a}\int_{0}^{\sqrt{a^2-y^2}}y^2\sqrt{x^2+y^2}\,dy\,dx$$

by changing into polar coordinates?

(a) $\frac{\pi a^3}{20}$ (b) $\frac{3\pi a^5}{20}$ (c) $\frac{3\pi a^3}{20}$ (d) $\frac{\pi a^5}{20}$

80. Ans: (d)

Sol:

$$I = \int_{y=0}^{a}\left[\int_{x=0}^{\sqrt{a^2-y^2}}y^2\sqrt{x^2+y^2}\,dx\right]dy$$

Then $y = 0$ to $y = a$

& $x = 0$ to $x = \sqrt{a^2-y^2}$ (or) $x^2+y^2 = a^2$

The given region of integration is the 1st quadrant of the circle $x^2 + y^2 = a^2$

To convert cartesian to polar coordinate, consider $x = r\cos\theta$, $y = r.\sin\theta$ and $|J| = r$

limits are $r = 0$ to a and $\theta = 0$ to $\theta = \frac{\pi}{2}$.

Now, $I = \int_{r=0}^{a}\int_{\theta=0}^{\frac{\pi}{2}} (r\sin\theta)^2 \sqrt{r^2\cos^2\theta + r^2\sin\theta}|J|dr\,d\theta$

$\Rightarrow \quad I = \int_{r=0}^{a}\int_{\theta=0}^{\frac{\pi}{2}} r^2.\sin^2\theta(r)(r)dr\,d\theta$

$\Rightarrow \quad I = \left(\frac{r^5}{5}\right)_0^a\left[\left(\frac{1}{2}\right)\frac{\pi}{2}\right] \qquad \left(\because \int_0^{\frac{\pi}{2}} \sin^2(\theta)d\theta = \frac{\pi}{4}\right)$

$\therefore \quad I = \frac{\pi a^5}{20}$

81. Who suggested pre-conventional, conventional and post conventional levels of moral development?
(a) Kohlberg (b) A. I. Melden
(c) John Locke (d) Gilligan

81. Ans: (a)

Sol: Lawrence Kohlberg proposed that moral reasoning develops in stages, grouped into three levels:

Pre-conventional level:

At this stage, morality is based on obedience and self-interest. A person follows rules mainly to avoid punishment or to gain rewards, not because of internal moral values.

Conventional level:

Here, individuals act to conform to social norms and expectations. Moral decisions are guided by the desire to maintain relationships, gain approval, and follow laws and rules to keep social order.

Post-conventional level:

At this highest level, morality is based on principles and values such as justice, human rights, and equality. A person may even question or challenge laws if they conflict with universal ethical principles.

82. Which one of the following inquiries seeks to identify and justify the morally-desirable norms or standards that should guide individuals and group?
(a) Normative inquiry (b) Conceptual inquiry
(c) Factual inquiry (d) Descriptive inquiry

82. Ans: (a)

Sol: Normative inquiry deals with what ought to be. It tries to determine which values, norms, or standards are morally right and should guide individual or group behavior. Normative inquiry is the branch of ethics that tries to decide what is right or wrong and what people ought to do. It does not just describe behavior; it evaluates actions and sets standards for good conduct. It asks questions like: What is the right thing to do? What values should guide society? What duties do individuals have toward others?

It also involves justifying moral principles. That means giving reasons why certain values such as justice, honesty, fairness, or respect for human dignity should be followed. Normative inquiry often uses ethical theories like duty-based ethics (deontology), consequence-based ethics (utilitarianism), and virtue ethics to decide what actions or rules are morally desirable.

Conceptual inquiry clarifies the meaning of ethical terms (like justice, rights, duty).

Factual inquiry focuses on facts and evidence about what is happening.

Descriptive inquiry describes how people actually behave or what moral beliefs they hold, without judging them.

83. Duty ethics theory was proposed by
(a) John Stuart Mill (b) Richard Brandt
(c) Jeremy Bentham (d) Immanuel Kant

83. Ans: (d)

Sol: Duty ethics (Deontological ethics) was proposed by Immanuel Kant.

Kant argued that morality is based on duty and adherence to universal moral rules, not on consequences. He introduced the idea of the Categorical Imperative, which says one should act only according to principles that could be followed universally.

84. Who framed the ethical code for builders in 1758?

(a) A. I. Melden (b) Aristotle
(c) C. W. D. Ross (d) Hammurabi

84. Ans: (d)

Sol: The ethical code for builders is associated with the Code of Hammurabi, the Babylonian king. His code contained laws regulating construction, including strict penalties if a building collapsed due to poor workmanship and caused harm.

85. Cost-benefit analysis is an application of

(a) Duty ethics (b) Utilitarianism
(c) Human ethics (d) Virtue ethics

85. Ans: (b)

Sol: Cost–benefit analysis is based on the principle of utilitarianism, which judges an action by its consequences. Utilitarianism, associated with thinkers like Jeremy Bentham and John Stuart Mill, holds that the best action is the one that produces the greatest benefit or happiness for the greatest number of people. In cost–benefit analysis, the total benefits of a decision are compared with its total costs or risks, and the option that gives the maximum net benefit is preferred. This focus on outcomes and overall welfare reflects the utilitarian approach to ethics.

86. Consider the following statements regarding cancellation laws:

Let A, B, C be n×n matrices, then

1. If rank A = n and AB = AC, then B = C.
2. If rank A = n, then AB = 0 implies B = 0. Hence if AB = 0, but A ≠ 0 as well as B ≠ 0, then rank A < n and rank B < n.

Which of the above statements is/are correct?

(a) 1 only (b) Both 1 and 2
(c) 2 only (d) Neither 1 nor 2

86. Ans: (b)

Sol: **statement (1)**

Given that $\rho(A_{n\times n}) = n$

$\Rightarrow |A_{n\times n}| \neq 0$

$\Rightarrow A^{-1}$ exists.

consider AB = AC

$\Rightarrow A^{-1}(AB) = A^{1}(AC)$

$\Rightarrow IB = IC$

$\Rightarrow B = C$

$\therefore$ 1st statement is true.

Statement (2)

Given that $\rho(A_{n\times n}) = n$

$\Rightarrow |A| \neq 0$

$\Rightarrow A^{-1}$ exists.

(i) If A & B are n^{th} order matrices such that AB = 0 and $A_{n\times n}$ is non-singular matrix then B = 0.

(ii) if AB = 0 for A ≠ 0 & B ≠ 0 then $|A_{n\times n}| = 0$ & $|B_{n\times n}| = 0$

$\Rightarrow \rho(A_{n\times n}) \neq n$ & $\rho(B_{n\times n}) \neq n$

$\therefore$ 2nd statement is also true.

HEARTY CONGRATULATIONS TO OUR
ESE-2025 TOP RANKERS

AIR 1 —  CE — MOHD. SHAQUIB

AIR 1 —  E&T — Utkarsh Pathak

AIR 1 —  EE — Rajan Kumar

AIR 1 —  ME — Nimesh Chandra

AIR 2 —  CE — PRAKHAR SHRI

AIR 2 —  E&T — RAJESH TIWARI

AIR 2 —  EE — VISHNU SAINI

AIR 2 —  ME — ASHOK KUMAR

AIR 3 —  CE — ARJUN SHARMA

AIR 3 —  E&T — PRASHANT LAVANIA

AIR 3 —  EE — OMPRAKASH RAJPUT

AIR 3 —  ME — HARI SINGH

AIR 4 —  CE — B USHNEESH NANDAN

AIR 4 —  EE — TUSHAR CHAUDHARY

AIR 4 —  E&T — PRADEEP SHUKLA

AIR 4 —  ME — RAO SIDDESH SHRIPAD

AIR 5 —  CE — KESHAV

AIR 5 —  E&T — ASHISH SINGH PATEL

AIR 5 —  EE — RAM KUMAR

5 —  ME — GOLLANGI SATEESH

AIR 6 —  E&T — TANYA TYAGI

AIR 6 —  EE — PUNIT MEENA

AIR 6 —  ME — AVINASH VERMA

AIR 7 —  E&T — PALAK MISHRA

AIR 7 —  EE — JYOTI KRISHNA PANDA

AIR 7 —  ME — PRASHANT SINGH

AIR 8 —  CE — AYUSH JAIN

AIR 8 —  E&T — HAYAT ALI

AIR 8 —  ME — MONU KUMAR

AIR 9 —  E&T — VIDHU SHREE

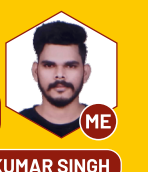
AIR 9 —  EE — DHRUV KAWAT

AIR 9 —  ME — NIKHIL SAHA

AIR 10 —  E&T — RAM PAL SINGH

AIR 10 —  CE — PUSHPENDRA K R

AIR 10 —  EE — AKSHIT PARASHARI

AIR 10 —  ME — AMIT KUMAR SINGH

Total 36 Ranks in Top-10 (E&T:10 | EE: 09 | CE:07 | ME: 10)

87. Match the following lists:

	List I		List II
P.	$\sin^2\theta \cot\theta \sec\theta$	1.	$\cos t\theta$
Q.	$\frac{\tan\theta+\sec\theta}{\sec\theta\left(1+\frac{\tan\theta}{\sec\theta}\right)}$	2.	$\sec\theta - \tan\theta$
R.	$\frac{1+\cot\theta}{1+\tan\theta}$	3.	$\sin\theta$
S.	$\sqrt{\frac{1-\sin\theta}{1+\sin\theta}}$	4.	1

Select the correct answer using the code given below:

	P	Q	R	S
(a)	3	1	4	2
(b)	1	3	2	4
(c)	3	4	1	2
(d)	4	3	2	1

87. Ans: (c)

Sol:

P. $\sin^2\theta \cot\theta \sec\theta$

$$= \sin^2\theta.\frac{\cos\theta}{\sin\theta}.\frac{1}{\cos\theta} = \sin\theta$$

$P \rightarrow 3$

Q. $$\frac{\tan\theta+\sec\theta}{\sec\theta\left(1+\frac{\tan\theta}{\sec\theta}\right)} = \frac{\tan\theta+\sec\theta}{\sec\theta\left(\frac{\sec\theta+\tan\theta}{\sec\theta}\right)}$$

$Q = 4$

88. The solution of differential equation $y = \frac{xy^2-\cos x \sin x}{y(1-x^2)}, y(0) = 2$ is

(a) $y^2(1 + x^2) - \cos^2 x = 3$

(b) $y^2(1 - x^2) + \cos^2 x = 5$

(c) $y^2(1 - x^2) + \cos^2 x = 7$

(d) $y^2(1 - x^2) - \cos^2 x = 3$

88. Ans: (d)

Sol: Given that $\frac{dy}{dx} = \frac{xy^2-\cos(x).\sin x}{y(1-x^2)}$ ...(1)

with $y(0) = 2$ ...(2)

$\Rightarrow$ $[xy^2 - \cos(x)\sin(x)]\,dx + (x^2y - y)\,dy = 0$

Here, $M_y = 2xy = N_x = 2xy$

$\therefore$ The given D.E (1) is an exact DE

Now, the general solution of (1) is

$$\int (xy^2-\cos(x).\sin x)dx + \int (-y)dy = c$$

$\Rightarrow$ $\frac{x^2y^2}{2} + \frac{1}{4}\cos(2x) - \frac{y^2}{2} = c$ ...(3)

using (2), (3) becomes

$\Rightarrow$ $c = \frac{-7}{4}$ ...(4)

$\therefore$ The solution of (1) from (3) & (4)

is $\frac{x^2y^2}{2} + \frac{1}{4}\cos(2x)\frac{-y^2}{2} = \frac{-7}{4}$

$\frac{y^2}{2}(x^2-1) + \frac{1}{4}\cos(2x) = \frac{-7}{4}$

$2y^2(x^2-1) + 2\cos^2 x - 1 = -7$

$2y^2(x^2-1) + 2\cos^2 x = -6$

$\therefore$ $x^2(1-x^2) - \cos^2(x) = 3$

89. The solution of differential equation $y'' + 4y' + 3y = e^t; y(0) = 0, y'(0) = 2$ is

(a) $y(t) = \frac{e^t-7e^{-3t}}{8} + \frac{3e^{-t}}{4}$

(b) $y(t) = \frac{e^t-5e^{-3t}}{8} + \frac{3e^{-t}}{4}$

(c) $y(t) = \frac{e^t+7e^{-3t}}{8} - \frac{3e^{-t}}{4}$

(d) $y(t) = \frac{e^t+7e^{-3t}}{8} + \frac{3e^{-t}}{4}$

89. Ans: (a)

Sol: Given that f(D) y = Q(t) ...(1)

Where $f(D) = D^2 + 4D + 3$ & $Q(t) = e^t$

with y(0) = 0 ...(2)

& y'(0) = 2 ...(3)

Here, the given condition y(0) = 0 satisfies with option (a)

∴ option (a) is true.

90. Which one of the following statements is correct in the context of quadratic forms $V = x^TAx$, where $x = [x_1, x_2 \dots x_n]^T$?

(a) $V < 0$ for all vectors x except $x = 0$ if and only if all the eigenvalues of A are positive

(b) $V \le 0$ for all vectors x and $V = 0$ for at least one vector $x \neq 0$, if and only if all the eigenvalues of A are non-negative and at least one of the eigenvalues is zero

(c) V is negative-definite if –V is positive-definite, with a corresponding condition on the eigenvalues of A

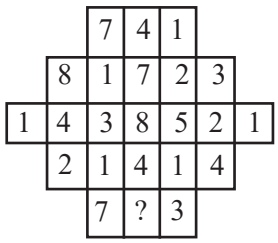
(d) V is negative-semi definite if –V is positive-semi definite, with a corresponding condition on the eigenvalues of –A

90. Ans: (c)

Sol: If all the eigen values of real symmetric matrix are positive then quadratic form $V = X^TAX$ is said to be positive definite

If "V" is a positive definite then "–V" is a negative definite and vice-vera.

91. What is the missing (?) value? (number puzzle)



(a) 6 (b) 4 (c) 5 (d) 2

91. Ans: (c)

Sol: Middle number = $\frac{1}{2}$ (sum of numbers on either side of it)

i.e $4 = \frac{7+1}{2}$

$7 = \frac{8+1+2+3}{2}$

$8 = \frac{1+4+3+5+2+1}{2}$

$4 = \frac{2+1+1+4}{2}$

$? = \frac{7+3}{2}$ Hence ? = 5.

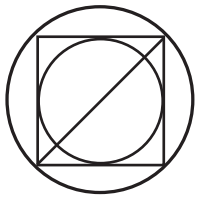
92. Consider a square of side 6 cm, a circle is inscribed inside the square. Another circle circumscribes the square. The ratio of the areas of the inscribed circle to the circumscribed circle is

(a) $1 : \frac{\pi}{4}$ (b) $1 : \pi$

(c) 1 : 15 (d) 1 : 2

92. Ans: (d)

Sol:



Hearty Congratulations to our students GATE - 2025

84 TIMES AIR 1st IN GATE

AIR 1 PI Devendra Umbrajkar

AIR 1 EE Pradip Chauhan

AIR 1 IN Kailash Goyal

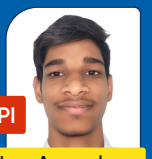
AIR 2 EE Kailash Goyal

AIR 2 ME Gollangi Sateesh

AIR 2 ES Jitesh Choudhary

AIR 3 ME Nimesh Chandra

AIR 3 ME Sanket Tupkar



AIR 3 PI Sadhan Anumala

AIR 3 XE Rohan Biswal

AIR 3 PI Aditya Kumar Prasad

AIR 3 IN ROHAN VIKRANT PAWAR

AIR 4 CE Harshil Maheshwari

AIR 5 EC Mohammed Nafeez

AIR 5 IN Sachin Yadav

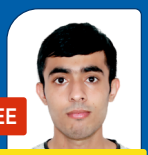
AIR 5 ME Uday G.

AIR 5 PI Kuldeep Singh naruka

AIR 6 CE Nimish Upadhyay

AIR 6 CE Shivanand Chaurasia

AIR 6 EE Shivam Kumar Gupta



AIR 6 EE Puneet Soni

AIR 6 EC P Jaswanth Bhavani

AIR 6 PI Kaushal Kumar Kaushik

AIR 7 EC Subhadip Dey

AIR 7 ME Abhinn Srivastava

AIR 7 IN Dev Jignesh Patel

AIR 7 DA Sairam Gudla

AIR 7 CS Hemanth Reddu P

AIR 7 PI Waleed Shaikh

AIR 7 XE Sanket Tupkar

AIR 8 ME Goutam Kumar

AIR 8 IN Pushpendra Payal

AIR 8 CS Rishi Sharma

AIR 9 EC Sai Charan Chilukuri

AIR 9 ME Rahul Paliwal

AIR 9 PI Anish Vanapalli

AIR 10 EE Neelava Mukherjee

AIR 10 ME Ashutosh kumar

AIR 10 ME Jetti Ganateja

AIR 10 ME Pitchika Kumar Vasu

AIR 10 CE Adnan Quasain

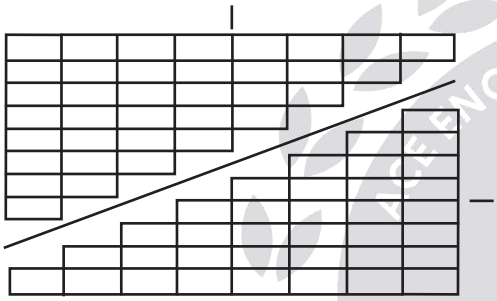
& many more...

Total 41 Ranks in Top-10

(ME: 10 | EC: 04 | EE: 05 | CE: 04 | CS: 02 | IN: 05 | DA: 01 | PI: 07 | XE: 02 | ES: 01)

	Inscribed circle		Circumscribed circle
Diameter	6	:	$6\sqrt{2}$
	1	:	$\sqrt{2}$
Area	1^2	:	$(\sqrt{2})^2$
	1	:	2

93. What does this diagram demonstrate?



(a) $1^2 + 2^2 + 3^2 + \ldots + n^2 = \frac{n(n+1)(2n+1)}{6}$

(b) $1 + 2 + 3 + \ldots + n = \frac{n(n+1)}{2}$

(c) $2^2 + 4^2 + 6^2 + \ldots + (2n)^2 = \frac{2n(n+1)(2n+1)}{3}$

(d) None of the above

93. Ans: (b)

Sol: $1 + 2 + 3 + \ldots + n = \frac{n(n+1)}{2}$

94. What is the missing (?) letter?

A	EGK	C
?		P
U		R
Q		V
B	OJF	D

(a) H (b) Z (c) L (d) Y

94. Ans: (b)

Sol: The letters follow a numerical sequence based on their position in the alphabet (A=1, B=2, etc.). Looking at the left column:

- B (2) to Q (17) is + 15
- Q (17) to U (21) is +4
- U (21) to Z (26) is + 5
- Z (26) to A (1) wraps around the alphabet (+1).

The sequence of intervals (15, 4, 5, 1) mirrors the logic found in the other sides of the square.

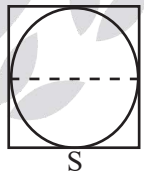
95. Following figure represents a circle inside a square. What does the diagram establish?

(a) $\pi < 4$ (b) $\pi > 3$

(c) $\pi > 2$ (d) $\pi \geq 2\sqrt{2}$

95. Ans: (a)

Sol:



diameter circle = side of square

$2r = S$

$r = \frac{S}{2}$

Area of square > Area of circle

$S^2 > \pi\left(\frac{S}{2}\right)^2$

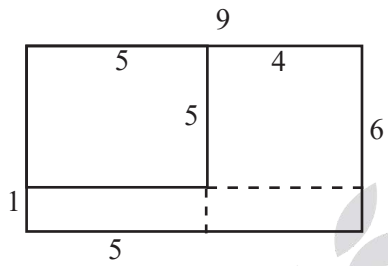
$S^2 \quad \frac{\pi S^2}{4} \Rightarrow 4 > \pi \Rightarrow \pi < 4$

96. A rectangular area of side 9 and 6 units is to be covered by square tiles of sides 1, 2 and 5 units. The minimum number of tiles needed for this is

(a) 13 (b) 11 (c) 12 (d) 15

96. Ans: (c)

Sol:



Cover with 1 tile of 5 × 5 size

Now we have two portions left one of 4 × 6 size and other of 5 × 1 size

to cover 4 × 6 size portion use 2 × 2 square tiles, for that we need $\frac{4\times6}{2\times2} = 2\times3 = 6$ tiles

to cover 5 × 1 size portion, number of 1 × 1 tiles = $\frac{5\times1}{1\times1} = 5$ tiles

Hence total tiles = 1 + 6 + 5 = 5 = 12.

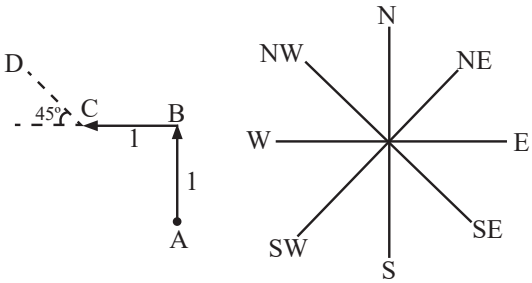
97. Nandini walks a distance of 1 km towards North. She then turns left and walks 1 km. Finally she turns right at an angle of 45° and starts walking. In which direction she is moving finally?

(a) South-West (b) North-West

(c) North-East (d) South-East

97. Ans: (b)

Sol:



Hence North - West.

98. Read the following information and answer the question that follows:

1. Six scientists A, B, C, D, E and F of the disciplines Chemistry, Botany, Zoology, Physics, Mathematics and Geology (not necessarily in order) want to demonstrate an integrated experiment based on inter-disciplinary approach.
2. Each day only one scientist will perform the part of his discipline.
3. The experiment will start on Monday and end on Sunday. One day will be the rest day, which otherwise is a part of the experiment.
4. Chemistry will be on the very next day of Geology.
5. A, who is a Mathematician, can perform either on second day or the last day but should not be immediately preceded by Botany.
6. C will demonstrate on the third day. Physics will be on the fifth day.
7. E, who is a Zoologist, performs on the second day.
8. B performs on Monday and the day after F's performance will be the rest day.

Which one of the following is the correct sequence of scientists performing?

(a) DBCAFE (b) BEDCFA

(c) BECDF A (d) CBEFDA

98. Ans: (c)

Sol:

Day	Scientist	Discipline
Mon	B	Boony
Tue	E	Zoologist
Wed	C	Chemistry
Thu	D	Geology
Fri	F	Physics
Sat	-	Restday
Sun	A	Mathematics

Hence Option (c)

99. The following question is based on the alphabet series:
ABCDEFGHIJKLMNOPQRSTUVWXYZ
If every alternate letter starting from B of the given alphabet is written in small letters, rest all are written in capital letters, how will the month of 'September' be written?
(a) SEpteMbeR (b) SEptEMbEr
(c) SEptembeR (d) sePTemBeR

99. Ans: (b)

Sol: All the letter with even place values are written in small letters, rest all are written in capital letters

	s	e	p	t	e	m	b	e	r
	19	5	16	20	5	13	2	5	18
⇒	S	E	p	t	E	M	b	E	r

100. The question below has some statement/argument/report/passage, followed by a few alternative answers marked A, B, C and D, of which only one would be the best possible answer. Read the passage/statement/argument carefully and choose the best possible answer from the alternatives given.

In an examination system of an institution, 100 students have been graded (from A–D in descending order) on the basis of the marks they received in the three terminal examinations, in which the pass-marks were 50%. Examiners are instructed to follow the following criteria:

1. All students who scored between 90% and 100% in any two examinations could receive an A.
2. Students who came in the top overall were to be awarded an A.
3. Notwithstanding I and II, if any student failed a paper, the highest he or she could get was a B.
4. The top 20 students in the whole year, when the overall examination percentages were averaged, could receive an A.

On the basis of above criteria, which of the following would definitely not be permissible?

(a) Bikash, who got 95% in Chemistry and 92% in Biology, received a B
(b) Suparna, who stood first in Physics and got 96% in Mathematics, received a B
(c) Amitava failed in English, but because he ranked 9th overall out of 100 students was awarded an A grade
(d) Bandana was given an A because she came 20th though she had failed to get above 90% in any of the three examinations.

100. Ans: (c)

Sol: Any person failing in a paper, the highest grade he or she could get is B, hence 'c' is not permissible.

FOLLOW US ON SOCIAL MEDIA

Scan the QR code to follow us on:

Telegram | YouTube | Instagram | Facebook | WhatsApp | Linkedin

WHY SHOULD YOU FOLLOW OUR SOCIAL MEDIA PLATFORMS?

- **Expert Guidance:** Access tips and strategies from experienced mentors.
- **Content:** Get exclusive notes, questions, and mock tests.
- **Interactive Learning:** Participate in live doubt-solving sessions and quizzes.
- **Exam & Job Updates:** Stay updated with the latest notifications and news.
- **Community Support:** Connect with peers and share resources.
- **Free:** All benefits are absolutely free!

JOIN US NOW AND BOOST YOUR EXAM PREPARATIONS!