GATE 2026 CS 1 Question Paper with Solutions

Time Allowed :3 Hour	Maximum Marks :100	Total Questions :65

General Instructions

Please read the following instructions carefully:

1. This question paper is divided into three sections:
   - **General Aptitude (GA):** 10 questions (5 questions × 1 mark + 5 questions × 2 marks) for a total of 15 marks.
   - **Environmental Science and Engineering + Engineering Mathematics:**
     - **Part A (Mandatory):** 36 questions (1 questions × 1 mark + 19 questions × 2 marks) for a total of 55 marks.
     - **Part B (Section 1):** Candidates can choose either Part B1 (Surveying and Mapping) or Part B2 (Section 2). Each part contains 16 questions (8 questions × 1 mark + 11 questions × 2 marks) for a total of 30 marks.
2. The total number of questions is **65**, carrying a maximum of **100 marks**.
3. The duration of the exam is **3 hours**.
4. Marking scheme:
   - For 1-mark MCQs, $\frac{1}{3}$ mark will be deducted for every incorrect response.
   - For 2-mark MCQs, $\frac{2}{3}$ mark will be deducted for every incorrect response.
   - No negative marking for numerical answer type (NAT) questions.
   - No marks will be awarded for unanswered questions.
5. Ensure you attempt questions only from the optional section (Part B1 or Part B2) you have selected.
6. Follow the instructions provided during the exam for submitting your answers.

1. Despite his initial hesitation, Rehman's _____ to contribute to the success of the project never wavered.

(A) ambivalence
(B) satisfaction
(C) resolve
(D) revolve

Correct Answer: (C) resolve

Solution:

Step 1: Understanding the sentence context.
The sentence states that although Rehman initially hesitated, his attitude toward contributing to the project *never wavered*. This means he remained firm and determined.

Step 2: Meaning of key words.
The blank must be filled with a word that indicates firmness, determination, or strong decision.

Step 3: Evaluating the options.
(A) ambivalence: Means mixed or contradictory feelings — this contradicts "never wavered."
(B) satisfaction: Means feeling pleased — does not fit the context of determination.
(C) resolve: Means firm determination — perfectly fits the meaning of the sentence.
(D) revolve: Means to rotate or move around — grammatically and contextually incorrect.

Step 4: Conclusion.
The correct word is **resolve** because it correctly expresses Rehman's firm determination despite hesitation.

Quick Tip

Remember: **Resolve = firm determination**. Use it when commitment remains strong despite difficulties.

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2. Bird : Nest :: Bee : _____

(A) Kennel
(B) Hammock
(C) Hive
(D) Lair

Correct Answer: (C) Hive

Solution:

Step 1: Understanding the type of analogy.
This is a **habitat-based analogy**. The relationship compares an animal with its natural home.

Step 2: Analyzing the first pair.
A **bird lives in a nest**. Therefore, the relationship is:

$$\text{Animal} \rightarrow \text{Its dwelling place.}$$

So we must find the correct dwelling place of a bee.

Step 3: Evaluating the options.
(A) Kennel: This is the home of a dog, not a bee.
(B) Hammock: This is a hanging bed, not an animal dwelling.
(C) Hive: This is the natural home of bees — correct match.
(D) Lair: This is the home of wild animals like lions or tigers, not bees.

Step 4: Conclusion.
Since a bird lives in a nest, similarly a bee lives in a **hive**. Hence, the correct answer is (C).

Quick Tip

Remember common animal homes: Bird → Nest, Bee → Hive, Dog → Kennel, Lion → Lair.

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3. If $Pe^x = Qe^{-x}$ for all real values of x, which one of the following statements is true?

(A) $P = Q = 0$
(B) $P = Q = 1$
(C) $P = 1;\ Q = -1$
(D) $\dfrac{P}{Q} = 0$

Correct Answer: (A) $P = Q = 0$

Solution:

Step 1: Start with the given equation.
We are given:

$$Pe^x = Qe^{-x}$$

This must hold for **all real values of** x.

Step 2: Rearranging the equation.
Multiply both sides by e^x:

$$Pe^{2x} = Q$$

Step 3: Apply the condition "for all real x".
The term e^{2x} changes value for different x. Therefore, the only way $Pe^{2x} = Q$ can remain true for **all** x is when:

$$P = 0$$

If $P = 0$, then from the original equation:

$$0 = Qe^{-x}$$

This is possible only if:

$$Q = 0$$

Step 4: Checking the options.
(A) $P = Q = 0$**:** Correct — satisfies the equation for all x.
(B) $P = Q = 1$**:** Incorrect — does not hold for all x.
(C) $P = 1, Q = -1$**:** Incorrect — violates the equation.
(D) $\frac{P}{Q} = 0$**:** Not sufficient — does not guarantee equality for all x.

Step 5: Conclusion.
The only values that satisfy the equation for all real x are:

$$\boxed{P = Q = 0}$$

Quick Tip

If an equation involving e^x must be true for all real x, any multiplying constant must be zero

4. Let p_1 and p_2 denote two arbitrary prime numbers. Which one of the following statements is correct for all values of p_1 and p_2?

(A) $p_1 + p_2$ is not a prime number.
(B) $p_1 p_2$ is not a prime number.
(C) $p_1 + p_2 + 1$ is a prime number.
(D) $p_1 p_2 + 1$ is a prime number.

Correct Answer: (B) $p_1 p_2$ is not a prime number.

Solution:

Step 1: Understanding the question.
We are given two arbitrary prime numbers p_1 and p_2. We must find a statement that is true for **all possible choices** of primes.

Step 2: Recall definition of prime numbers.
A prime number has exactly two divisors: 1 and itself. Any number that has more than two divisors is composite.

Step 3: Analyze each option.

(A) $p_1 + p_2$ is not a prime number.
Counterexample: If $p_1 = 2$, $p_2 = 3$, then

$$p_1 + p_2 = 5$$

which is prime. Hence, this statement is **not always true**.

(B) $p_1 p_2$ is not a prime number.
Since both p_1 and p_2 are primes and greater than 1, their product has at least three divisors:

$$1,\ p_1,\ p_2,\ p_1 p_2$$

Therefore, $p_1 p_2$ is always composite, never prime. This statement is **true for all primes**.

(C) $p_1 + p_2 + 1$ is a prime number.
Counterexample: If $p_1 = 2$, $p_2 = 3$:

$$2 + 3 + 1 = 6$$

which is composite. Hence, this is false.

(D) $p_1 p_2 + 1$ is a prime number.
Counterexample: If $p_1 = 3$, $p_2 = 5$:

$$3 \times 5 + 1 = 16$$

which is composite. Hence, this is false.

Step 4: Conclusion.
The only statement that is always correct for any two primes is:

$$\boxed{p_1 p_2 \text{ is not a prime number}}$$

Quick Tip

Product of two primes is always composite because it has at least three divisors: 1, each prime, and their product.

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5. Based only on the conversation below, identify the logically correct inference:
"Even if I had known that you were in the hospital, I would not have gone there to see you," Ramya told Josephine.

(A) Ramya knew that Josephine was in the hospital.
(B) Ramya did not know that Josephine was in the hospital.
(C) Ramya and Josephine were once close friends; but now, they are not.
(D) Josephine was in the hospital due to an injury to her leg.

Correct Answer: (B) Ramya did not know that Josephine was in the hospital.

Solution:

Step 1: Understanding the statement.
Ramya says: "Even if I had known that you were in the hospital, I would not have gone there to see you." This is a **counterfactual conditional statement** — it refers to a hypothetical situation that did *not actually occur*.

Step 2: Interpreting the logic.
The phrase **"even if I had known"** implies that in reality, Ramya *did not know* Josephine was in the hospital. She is imagining a situation contrary to fact.

Step 3: Evaluating the options.
(A) Ramya knew that Josephine was in the hospital: Incorrect — contradicts the wording of the sentence.

(B) Ramya did not know that Josephine was in the hospital: Correct — this is directly implied by the phrase "even if I had known."

(C) Ramya and Josephine were once close friends: Not supported by the statement — no such information is given.

(D) Josephine was in the hospital due to a leg injury: No evidence in the passage — purely speculative.

Step 4: Conclusion.
The only logically valid inference from the given conversation is that **Ramya did not know Josephine was in the hospital**.

Quick Tip

In logic questions, phrases like "even if I had known" usually indicate that the speaker *did not actually know* the fact in reality.

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6. A machine receives an IPv4 datagram. The protocol field of the IPv4 header has the protocol number of a protocol X. Which ONE of the following is NOT a possible candidate for X?

(A) Internet Control Message Protocol (ICMP)
(B) Internet Group Management Protocol (IGMP)
(C) Open Shortest Path First (OSPF)

(D) Routing Information Protocol (RIP)

Correct Answer: (D) Routing Information Protocol (RIP)

Solution:

Step 1: Understanding the IPv4 protocol field.
In the IPv4 header, the 8-bit **Protocol field** specifies the protocol used in the **payload** of the IP packet. It directly identifies protocols that operate at the network layer or are carried directly over IP.

Step 2: Recall relevant protocol numbers.
Some standard IPv4 protocol numbers are:
- ICMP = 1
- IGMP = 2
- OSPF = 89
These are directly identified in the IPv4 protocol field.

Step 3: Analyzing the options.

(A) ICMP: Operates directly over IP and has a valid protocol number → Possible candidate.

(B) IGMP: Also operates directly over IP and has its own protocol number → Possible candidate.

(C) OSPF: Is a routing protocol that runs directly over IP (protocol number 89) → Possible candidate.

(D) RIP: Incorrect option. RIP does *not* run directly over IP; it runs over **UDP** (usually port 520). Therefore, it cannot appear in the IPv4 protocol field.

Step 4: Conclusion.
Since RIP is encapsulated inside UDP and not carried directly by IP, it **cannot be the value of the IPv4 protocol field**. Hence, the correct answer is (D).

Quick Tip

Remember: The IPv4 protocol field contains only protocols that run directly over IP (e.g., ICMP, IGMP, OSPF). Application or transport-layer protocols like RIP-over-UDP do not appear here.

7. Consider an unordered list of N distinct integers. What is the minimum number of element comparisons required to find an integer in the list that is NOT the largest in the list?

(A) 1
(B) $N - 1$
(C) N
(D) $2N - 1$

Correct Answer: (A) 1

Solution:

Step 1: Understanding the requirement.
We are **not** asked to find the largest element. We are only asked to find **any element that is NOT the largest**. This is much easier than finding the maximum.

Step 2: Key observation.
If we compare any two distinct elements in the list, one of them must be smaller than the other. That smaller element **cannot be the largest element of the list**.

Step 3: Minimum comparisons.
Therefore, a single comparison between any two elements is sufficient: - Compare a_1 and a_2. - The smaller of the two is guaranteed to be **not the largest** in the list.
So, only **1 comparison** is needed in the best and worst case.

Step 4: Analyzing the options.
(A) 1: Correct — one comparison is sufficient.
(B) $N - 1$**:** Needed to find the maximum, not a non-maximum.
(C) N**:** Too many comparisons.
(D) $2N - 1$**:** Irrelevant for this problem.

Step 5: Conclusion.
The minimum number of comparisons required is $\boxed{1}$.

Quick Tip

To find a non-maximum element, just compare any two distinct elements — the smaller one is guaranteed to be non-maximum.

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8. Consider a network that uses Ethernet and IPv4. Assume that IPv4 headers do not use any options field. Each Ethernet frame can carry a maximum of 1500 bytes

in its data field. A UDP segment is transmitted. The payload (data) in the UDP segment is 7488 bytes. Which ONE of the following choices has the CORRECT total number of fragments transmitted and the size of the last fragment including IPv4 header?

(A) 5 fragments, 1488 bytes
(B) 6 fragments, 88 bytes
(C) 6 fragments, 108 bytes
(D) 6 fragments, 116 bytes

Correct Answer: (D) 6 fragments, 116 bytes

Solution:

Step 1: Compute total size of the IP datagram before fragmentation.
Given:
- UDP payload = 7488 bytes
- UDP header = 8 bytes

Total data carried by IP = $7488 + 8 = 7496$ bytes.

Since IPv4 has no options, IP header = 20 bytes. So total original IP packet size = $7496 + 20 = 7516$ bytes.

Step 2: Determine maximum data per fragment.
Ethernet MTU = 1500 bytes (includes IP header + data).

Maximum data per IP fragment =

$$1500 - 20 = 1480 \text{ bytes}$$

(Note: 1480 is divisible by 8, which is required for IP fragmentation.)

Step 3: Compute number of fragments.

Total data to fragment = 7496 bytes.
Number of full fragments:

$$\left\lfloor \frac{7496}{1480} \right\rfloor = 5$$

Remaining bytes for last fragment:

$$7496 - (5 \times 1480) = 96 \text{ bytes}$$

So total fragments = $5 + 1 = \boxed{6}$.

Step 4: Compute size of last fragment.

Last fragment payload = 96 bytes. Add IP header (20 bytes):

$$96 + 20 = \boxed{116 \text{ bytes}}$$

Step 5: Analyze the options.
(A) 5 fragments, 1488 bytes: Incorrect — needs 6 fragments.
(B) 6 fragments, 88 bytes: Incorrect last size.
(C) 6 fragments, 108 bytes: Incorrect last size.
(D) 6 fragments, 116 bytes: Correct.

Step 6: Conclusion.
The correct answer is **6 fragments, 116 bytes**.

Quick Tip

Remember: Max IP data per Ethernet frame = 1500 – 20 = 1480 bytes, and fragment size must be a multiple of 8 bytes.

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9. Which ONE of the following languages is accepted by a deterministic pushdown automaton?

(A) Any regular language.
(B) Any context-free language.
(C) Any language accepted by a non-deterministic pushdown automaton.
(D) Any decidable language.

Correct Answer: (A) Any regular language

Solution:

Step 1: Understanding deterministic pushdown automaton (DPDA).
A deterministic pushdown automaton (DPDA) is a type of pushdown automaton in which, for every state, input symbol, and stack symbol, there is at most one possible transition. Unlike NPDA, it cannot make multiple choices.

Step 2: Languages accepted by DPDA.
DPDA can accept only a proper subset of context-free languages, called **deterministic context-free languages (DCFLs)**. However, every regular language can always be accepted by a DPDA.

Step 3: Relationship with other language classes.
Regular languages Deterministic CFLs Context-Free Languages.

Step 4: Analyzing the options.
(A) Any regular language: Correct — every regular language can be accepted by a DPDA (a DPDA can simply ignore its stack).

(B) Any context-free language: Incorrect — some CFLs (e.g., $\{ww^R\}$) require non-determinism and cannot be accepted by a DPDA.

(C) Any language accepted by an NPDA: Incorrect — NPDAs are strictly more powerful than DPDAs.

(D) Any decidable language: Incorrect — many decidable languages are not even context-free, so DPDA cannot accept them.

Step 5: Conclusion.
The correct answer is **(A) Any regular language**.

Quick Tip

Remember: DPDA accepts all regular languages but only some context-free languages (not all).

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10. An audit of a banking transactions system has found that on an earlier occasion, two joint holders of account A attempted simultaneous transfers of Rs. 10000 each from account A to account B. Both transactions read the same value, Rs. 11000, as the initial balance in A and were allowed to go through. B was credited Rs. 10000 twice. A was debited only once and ended up with a balance of Rs. 1000. Which of the following properties is/are certain to have been violated by the system?

(A) Atomicity
(B) Consistency
(C) Isolation
(D) Durability

Correct Answer: (C) Isolation

Solution:

Step 1: Understanding the scenario.
Two transactions were executed concurrently: - Each transaction read the same balance Rs. 11000 from account A. - Each attempted to transfer Rs. 10000 to account B. - As a result, B received Rs. 20000, but A was debited only Rs. 10000 and ended with Rs. 1000. This is clearly an incorrect outcome.

Step 2: Understanding ACID properties.
In DBMS: - **Atomicity**: Either the entire transaction happens or nothing happens. - **Consistency**: Database moves from one valid state to another valid state. - **Isolation**: Concurrent transactions should not interfere with each other. - **Durability**: Once committed, changes must persist even after failure.

Step 3: Identifying the violation.
Both transactions read the same initial balance before either wrote its update. This is a classic **lost update problem**, which occurs when isolation is not properly enforced. If isolation had been ensured, the second transaction would have seen the updated balance after the first transaction.

Step 4: Analyzing the options.
(A) Atomicity: Not violated — both transactions completed fully.
(B) Consistency: It appears violated in effect, but the root cause is lack of isolation.
(C) Isolation: Correct — concurrent transactions interfered with each other.
(D) Durability: Not violated — data was stored after transactions.

Step 5: Conclusion.
The property certainly violated is **Isolation**.

Quick Tip

Remember: Lost update problem arises due to violation of the **Isolation** property.
