

SECTION A



C-CAT Section A: FINAL REVISION CARD



QUANTS (Speed Mode)

- **Time & Work:** Use LCM method. Total Work = LCM of days. (A+B) efficiency = Add units.
- **Train/Speed:** $\text{km/h} \rightarrow \text{m/s} = \times \frac{5}{18}$. Relative Speed: Same Dir (\$-\$), Opp Dir (\$+\$).
- **Profit:** Profit/Loss always on **CP**. Discount always on **MP**.
- **SI vs CI (2 yrs):** $\text{Diff} = \text{SP} \times \left(\frac{R}{100}\right)^2$.
- **Fractions:** $\frac{1}{3}=33.3\%$, $\frac{1}{6}=16.6\%$, $\frac{1}{8}=12.5\%$, $\frac{1}{11}=9.09\%$.



LOGIC (Pattern Mode)

- **Clock Angle:** $\theta = |30H - 5.5M|$.
- **Calendar:** Normal Year (+1 day), Leap (+2). Repeat: Leap(+28), L+1(+6), L+2/3(+11).
- **Alphabet:** EJOTY (5, 10, 15, 20, 25). Opposite: A-Z, B-Y, C-X... M-N.
- **Ranking:** Total = (Left + Right) - 1.



ENGLISH (Grammar Mode)

- **One of the...** \rightarrow Singular Verb ("One of the boys **is**").
- **Lest...** \rightarrow **Should**.
- **Scarcely/Hardly...** \rightarrow **When**.
- **No sooner...** \rightarrow **Than**.
- **Die OF** disease; **Die FROM** cause.



EXAM STRATEGY

1. **Skip Truncators:** If a puzzle takes > 2 mins, MARK & SKIP.
2. **Eliminate:** Don't solve fully if you can eliminate 3 options.
3. **Stay Calm:** If Q1 is hard, Q2 might be easy. Keep moving.

You are ready. Go crush it

SECTION B

Part 1: Formulas & Key Concepts (The "Theory" Block)

A. C Programming (The Core)

- **Operator Precedence (Memorize Order):**
 - **Unary** (`!`, `~`, `++`, `--`, `sizeof`) \rightarrow Right to Left
 - **Arithmetic** (`*`, `/`, `%` then `+`, `-`)
 - **Bitwise** (`<<`, `>>` then `&`, `^`, `|`)
 - **Logical** (`&&` then `||`)
 - **Assignment** (`=`) \rightarrow Right to Left
- **Format Specifiers:** `%d` (int), `%f` (float), `%lf` (double), `%p` (pointer address), `%s` (string).
- **Storage Classes:**
 - **auto:** Local scope, garbage value.
 - **static:** Preserves value between function calls, initialized to 0.
 - **extern:** Global visibility.
 - **register:** Stored in CPU register (fast access), cannot use `&` operator.

B. Data Structures (The Logic)

- **Tree Formulas:**
 - **Max nodes at height h :** $2^{h+1} - 1$ (if root height = 0, check question convention).
 - **Leaf Nodes vs Degree 2 Nodes:** In a Binary Tree, $\text{Leaves} = \text{Nodes}(\text{degree } 2) + 1$.
- **Sorting Complexities (Worst Case):**
 - **Bubble/Insertion/Selection:** $O(n^2)$
 - **Quick Sort:** $O(n^2)$ (but $O(n \log n)$ average).
 - **Merge/Heap Sort:** $O(n \log n)$ always.
- **Stack:** Used for Recursion, Balancing symbols, Infix to Postfix.
- **Queue:** Used for BFS, CPU Scheduling, Print spooling.

C. Operating Systems (The Manager)

- **Scheduling Formulas:**
 1. **Turnaround Time (TAT):** $\text{Completion Time} - \text{Arrival Time}$.
 2. **Waiting Time (WT):** $\text{TAT} - \text{Burst Time}$.
- **Deadlock Conditions (Coffman's Conditions):**
 1. **Mutual Exclusion.**
 2. **Hold and Wait.**
 3. **No Preemption.**
 4. **Circular Wait.** (All 4 must hold for deadlock).

D. Computer Networks (The Connection)

- OSI Layers (Please Do Not Throw Sausage Pizza Away):
 - Physical, Data Link, Network, Transport, Session, Presentation, Application.
 - IP Classes (First Octet):
 - A: 1 – 126
 - B: 128 – 191
 - C: 192 – 223
 - Loopback: 127.x.x.x
 - Subnetting: Number of hosts = $2^n - 2$ (where n is host bits; -2 for Network ID & Broadcast IP).
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Part 2: Repeated PYQs & Patterns

C Programming (Output Based)

1. The `printf` inside `printf`:
 - Q: `printf("%d", printf("CDAC"));`
 - Logic: Inner `printf` prints "CDAC" and returns length (4). Outer prints 4.
 - Output: CDAC4.
2. Static Variable Logic:
 - Q: Function with `static int i=0; i++; return i;` called 3 times.
 - Logic: `i` is not re-initialized. It becomes 1, then 2, then 3.
3. String literal modification:
 - Q: `char *p = "Hello"; p[0] = 'M';`
 - Logic: String literals are in read-only memory. This causes a Segmentation Fault (Runtime Error).

Data Structures

4. Postfix Evaluation:
 - Q: Evaluate `5 3 + 2 *`.
 - Logic: Push 5, Push 3. See `+`: Pop 3, 5 \rightarrow $5+3=8$. Push 8. See `*`: Push 2. $8*2=16$.
5. Tree Traversals:
 - Q: Given Inorder and Preorder, find Postorder.
 - Tip: Preorder's first element is always the Root. Split Inorder based on root to find Left/Right subtrees.

Operating Systems

6. Belady's Anomaly:
 - Q: Which algorithm suffers from Belady's Anomaly (More frames = More page faults)?
 - Answer: FIFO (First In First Out).
7. Banker's Algorithm:
 - Q: Primary purpose of Banker's Algorithm?

- Answer: Deadlock Avoidance.

Networking

8. Ping Command:

- Q: Ping uses which protocol?
- Answer: ICMP (Internet Control Message Protocol).

9. Port Numbers:

- HTTP (80), HTTPS (443), FTP (21), SSH (22), DNS (53), SMTP (25).

Part 3: The "Tricky" Traps (Negative Marking Magnets)

1. The Macro Expansion Trap (C Prog)

- Q:
- C

```
#define SQR(x) x*x
```

```
main() { printf("%d", SQR(2+3)); }
```

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- The Trap: Thinking $(2+3)^2 = 25$.
- Reality: It expands literally: $2 + 3 * 2 + 3$.
- Calculation: $2 + 6 + 3 = 11$.
- Fix: Use brackets in macros: `#define SQR(x) ((x)*(x))`

2. The "sizeof" Character Constant

- Q: `sizeof('A')` in C?
- The Trap: 1 byte (char).
- Reality: In C, character constants are treated as integers.
- Answer: 4 bytes (or 2 depending on compiler int size). *Note: In C++, it is 1 byte.*

3. Octal Numbers

- Q: `int a = 010; printf("%d", a);`
- The Trap: Prints 10.
- Reality: Leading 0 means Octal. $1 \times 8^1 + 0 \times 8^0 = 8$.
- Answer: 8.

4. Logical Short Circuit

- Q:
- C

```
int a=10, b=5;
```

```
if (a > 20 && ++b > 5) ... printf("%d", b);
```

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- The Trap: Incrementing b to 6.
- Reality: In `&&`, if the first condition (`a>20`) is False, the second part (`++b`) is NEVER executed.
- Answer: b remains 5.

5. Linked List Cycle Detection

- Q: What is the complexity to detect a loop using Floyd's Cycle (Tortoise & Hare)?
- The Trap: $O(n^2)$.
- Reality: It is $O(n)$.

6. Router vs Switch

- Q: Device used to connect different networks (different subnets)?
- The Trap: Switch.
- Reality: Switch connects devices in the *same* network (LAN). Router connects different networks (WAN/LAN).

7. Fork System Call

- Q: `fork(); fork(); fork();` How many child processes created?
- Formula: $2^n - 1$.
- Answer: $2^3 - 1 = 7$ (Total processes = 8, Children = 7).

Part 4: Section B Last Minute Revision Card

C PROGRAMMING

- Arrays: Name of array is a constant pointer to the first element. `arr[i] == *(arr+i)`.
- Struct vs Union: Struct size = Sum of members (padded). Union size = Largest member.
- Pointers: `int *p[5]` (Array of pointers) vs `int (*p)[5]` (Pointer to array).

DATA STRUCTURES

- Stack: LIFO (Last In First Out). Queue: FIFO.
- BST: Left < Root < Right. Time: $O(\log n)$ avg, $O(n)$ worst (skewed).
- Graph: BFS uses Queue. DFS uses Stack.
- Hashing: Best search time $O(1)$.

OS & NETWORK

- **Kernel: Core of OS.**
- **Semaphore: Synchronization tool (Wait/Signal or P/V operations).**
- **Fragmentation: Paging causes Internal; Segmentation causes External.**
- **TCP: Reliable, Connection-oriented (Slow).**
- **UDP: Unreliable, Datagram (Fast, for video/gaming).**

EXAM TIP for SECTION B:

Unlike Section A, do not guess here. Code snippets often have syntax errors or subtle logic changes (like ; after a for loop). Read the code character-by-character.

Would you like a deep dive into OOPs (C++) concepts as well, since that is a smaller part but often appears?