

## SECTION A

---



### C-CAT Section A: FINAL REVISION CARD

1 2  
3 4

#### QUANTS (Speed Mode)

- **Time & Work:** Use LCM method. Total Work = LCM of days. (A+B) efficiency = Add units.
- **Train/Speed:** km/h  $\rightarrow$  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):** Diff =  $P \times (\frac{R}{100})^2$ .
- **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,  $\text{Leaves} = \text{Nodes(degree 2)} + 1$ .
- 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).
- 

## 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 2: Push 2. See \*: Pop 2, 8 \$\rightarrow\$ \$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)); }
```

- 
- 
- 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);
```

- 
- 
- 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?**