You're absolutely right 👍 The **Index had 18 sections**, so the **Interview-Focused Q&A** (section 20) should feel a bit more comprehensive than just 15 questions. Let's expand it properly to around **25–30 solid interview questions** — short, sharp, and complete.

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20. Interview-Focused Questions (Q&A)

Q1. What is Node.js and why is it popular?

A: Node.js is a **JavaScript runtime** built on **V8 engine**, known for its **event-driven, non-blocking I/O model**. Popular because of speed, scalability, and using JS for both frontend & backend.

Q2. How does the Event Loop work in Node.js?

A: The **event loop** manages async tasks in phases (timers → pending callbacks → idle → poll → check → close). It enables concurrency on a single thread.

Q3. Process vs Thread in Node.js?

A:

- **Process**: independent memory space.
- **Thread**: lightweight, within a process.
- Node runs JS in a **single thread**, but libuv uses worker threads for async tasks.

Q4. What are Streams in Node.js?

A: Streams process **data in chunks**. Types: **Readable**, **Writable**, **Duplex**, **Transform**. Useful for large files, sockets, video streaming.

Q5. Explain Middleware in Express.js.

A: Middleware are functions executed between request and response. Used for logging, auth, body parsing, error handling.

Q6. Difference between CommonJS and ES Modules?

A:

- **CommonJS** → `require()`, `module.exports`.
- **ESM** → `import/export`. Modern standard, enabled with `"type": "module"`.

Q7. How do you scale Node.js apps?

A: Use **clustering (PM2, cluster module)**, **load balancing (Nginx, HAProxy)**, **caching (Redis)**, **microservices**, and **message queues**.

Q8. What is Clustering in Node.js?

A: Clustering spawns multiple Node processes across CPU cores, sharing the same server port. Improves scalability.

Q9. Difference between process.nextTick() and setImmediate()?

A:

- `process.nextTick()` runs **before** the next event loop phase.
- `setImmediate()` runs in the **check phase** (after I/O).

Q10. How do you handle errors in Node.js?

A:

- Sync → `try/catch`.
- Async → `.catch()` or `try...catch` with async/await.
- Event emitters → `error` event.
- Centralized Express error middleware.

Q11. How do you secure a Node.js app?

A:

- **Helmet.js** (HTTP headers).
- **Input validation** (Joi, Zod).
- Prevent **XSS, CSRF, SQL Injection**.
- Use **rate limiting**, **CORS**, **JWT/OAuth2**.

Q12. What are some performance optimization techniques?

A:

- Use **async I/O**, not blocking.
- **Streams** for large data.
- **Clustering + PM2**.
- **Compression, caching (Redis)**.
- Optimize DB queries & indexes.

Q13. Difference between Monolithic and Microservices architecture?

A:

- **Monolith** → single codebase, tightly coupled.
- **Microservices** → multiple independent services, communicate via APIs/queues.

Q14. What are Message Queues in Node.js?

A: Tools like **RabbitMQ, Kafka, Redis Pub/Sub** handle async tasks, event-driven workflows, and decouple services.

Q15. Explain JWT Authentication.

A: JWT (JSON Web Token) is a **stateless token** containing user claims. Sent in headers, verified using secret/private key.

Q16. What is the difference between OAuth2 and JWT?

A:

- **JWT** → a token format.
- **OAuth2** → an authorization protocol (can use JWTs internally).

Q17. What is CORS in Node.js?

A: Cross-Origin Resource Sharing → controls which origins can access resources. Enabled via `cors` middleware in Express.

Q18. What are Worker Threads in Node.js?

A: Module to run CPU-intensive tasks in parallel threads without blocking the main event loop.

Q19. Difference between fork, spawn, and exec?

A:

- **spawn** → child process with streaming output.
- **exec** → child process with buffered output.
- **fork** → specialized for Node child processes with IPC.

Q20. What is Pub/Sub in Redis?

A: Publisher sends messages to channels, subscribers receive them. Used in **real-time apps (chat, notifications)**.

Q21. How does Node.js handle file I/O?

A: Through **non-blocking async APIs** in `fs` module (`fs.promises.readFile`) and **streams** (`createReadStream`).

Q22. How do you test Node.js applications?

A:

- Unit testing → Jest, Mocha/Chai.
- API testing → Supertest.
- End-to-end → Cypress, Playwright.

Q23. What are some debugging tools in Node.js?

A:

- Built-in inspector (`node --inspect`).
- Chrome DevTools.
- Logging with **Winston/Morgan**.
- Profiling with **Node Clinic, PM2 Monitoring**.

Q24. What is Serverless in Node.js?

A: Running Node code in cloud-managed environments like **AWS Lambda, GCP Functions, Azure Functions**. No infra mgmt, pay per execution.

Q25. Difference between REST and GraphQL in Node.js?

A:

- **REST** → multiple endpoints, over-fetching possible.
- **GraphQL** → single endpoint, clients query exactly what they need.

Q26. What is the role of package.json and package-lock.json?

A:

- `package.json` → project metadata, dependencies.
- `package-lock.json` → exact dependency tree for reproducible installs.

Q27. What is Semantic Versioning (semver)?

A: `MAJOR.MINOR.PATCH`

- Major = breaking changes.
- Minor = backward-compatible features.
- Patch = bug fixes.

Q28. How do you prevent callback hell?

A: Use **Promises** or **async/await** instead of nested callbacks.

Q29. What are some differences between Node.js and Laravel (PHP)?

A:

- **Node.js** → JS runtime, async non-blocking I/O, single-threaded.
- **Laravel** → PHP framework, synchronous by default, multi-threaded requests.
- Node is better for **real-time apps**, Laravel good for **monoliths with ORM**.

Q30. When would you NOT use Node.js?

A:

- CPU-heavy apps (ML training, video rendering).
- Apps requiring multithreading natively.
- Long-running tasks (better in background workers).

☑ Now you've got a **30-question Q&A sheet** — compact yet comprehensive enough for **interviews & revision**.

Do you want me to also create a **final one-page summary** (like a quick cheat sheet of diagrams + bullet points across all 18 sections)?