Solutions

Marking: **M1** a correct method, **A1** the correct answer, **B1** an independent mark.

Each answer shows the steps, then the **result**.

2.1

200 OK; 301 moved permanently

404 not found; 503 service unavailable

2.2

up to **1 hour**

lower the TTL (e.g. to 60 s) a day before the move

2.3

root → the `.cn` servers

`.cn` → the `edu.cn` servers; `edu.cn` → the `uni.edu.cn` servers

`uni.edu.cn` → the address of `cs.uni.edu.cn`

2.4

GET only reads, so repeating it changes nothing (idempotent)

POST may create or pay again

so a repeated POST could charge the user twice

3.1

(a) $21 \times 2 = 42$ RTT = **1680** ms

(b) $1 + 21 = 22$ RTT = **880** ms

(c) connect, HTML, images: 3 RTT = **120** ms

(d) 1 RTT: 40 ms, giving 160 ms

3.2

(a) `Cache-Control: max-age=86400` (one day) or longer; the HTML has `ETag: "v42"`, and the browser asks with `If-None-Match: "v42"`; if unchanged the server replies `304 Not Modified` with no body

(b) name the file `logo.v2.png` and update the link in the HTML; the new name is a new URL, so the old cached copy is never used, and the file can be cached for a long time

3.3

(a) `GET /books?q=signals`; `POST /loans` with the copy id; `POST /loans/{id}/renewals` or `PATCH /loans/{id}`

(b) `409 Conflict` (or `422`): the request is valid but breaks a rule of the loan's state

(c) a rate limit per client, e.g. 10 requests a second, answering `429 Too Many Requests` with a `Retry-After` header

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(d) in pages, e.g. 50 at a time, with a link or cursor to the next page, so no response holds all 40 000