Things you must remember (or know how to derive)

Include but not limited to:

1. Block-diagram manipulation rules
2. DC motor modeling and connection with a general load
3. Open-loop plant inversion with $C(s) = T_r(s)/P(s)$: what are conditions on the plant $P(s)$ and the reference model $T_r(s)$ for which this is possible
4. BIBO stability: definition and criterion
5. Steady-state specifications (steady-state error and how to compute it in the s-domain)
6. Transient specifications (definitions of overshoot, undershoot, rise time, settling time)
7. Main parameters of 1st and 2nd order systems (static gain, time constant, natural frequency, damping factor) and their *qualitative* relations with steady-state and transient characteristics
8. Understanding of the effect of additional poles and zeros on transient responses of 1st and 2nd order systems
9. Transient specs and pole location (*qualitatively*) with "good" areas in the s-plane
10. Frequency-domain properties of signal and systems (spectrum, energy, power, bandwidth, resonant peak), connections with time-domain properties, like "fast" / "slow", oscillatory (*qualitatively*)
11. Closed-loop vs. open-loop strategies: advantages and disadvantages
12. Closed-loop transfer functions in the unity-feedback configuration
13. Internal stability of feedback systems: definition and criteria
14. Steady-state performance of feedback systems: number of integrators and their location (on $P(s)$ or in $C(s)$) required to zero steady-state errors from r / d in the unity feedback configuration (not the table), types of feedback systems
15. Root-locus method for $b_m > 0$: definition and meaning, number of branches, where each branch starts and ends, the gain and phase rules, the center of gravity and asymptotes angles, $j\omega$-axis crossings, high-gain feedback insight
16. Simple root-locus design to satisfy requirements on steady-state errors and dominant pole properties
17. Loop shaping requirements (in low- and high-frequency ranges)
18. The argument principle
19. The Nyquist stability criterion (with and without integrators in $L(s)$), crossover frequency ω_c, phase crossover frequency ω_ϕ, stability margins (both on Nyquist and Bode diagrams)
20. The delay element, its effect on the frequency response and the Nyquist criterion, the delay margin
21. Connections between root locus and Nyquist plot (no. of integrators, $j\omega$-axis crossings, stability/instability)
22. Lead and lag controllers (*qualitatively*) and their use to achieve required phase margin and static gains
23. Ziegler-Nichols procedure and its connection with properties of $L(s)$
24. 2DOF controllers: why to use them
25. Bode and Nyquist plots of elementary transfer functions: $\dfrac{1}{s^n}$ $(n = 1, 2, \ldots)$, $\dfrac{k}{\tau s + 1}$, $\dfrac{k\omega_n^2}{s^2 + 2\zeta\omega_n s + \omega_n^2}$, e^{-sh}

Perhaps I forgot something, so learn more to be on the safe side…