No.	Topics
1	**Time domains design** **Maximum overshoot Mp, Rise Time Tr, Settling Time Ts** **Steady State Error Calculation**
2	**Ziegler & Nichols PID Design (formula are NOT given)** **Critical Gain and Period calculation** **Z-transform implementation**
3	**Time-domains Design Specifications to S-domain design region** **Root locus concepts**
4	**State Space Model** **Linearized Model for the Non-linear System**
5	**Root locus controller design (s+z)/(s+p) Lead/ Lag controller**
6	**Frequency domain design for (s+z)/(s+p) Lead/ Lag controller**

Part A **10%**	**10 Short Questions** **MC/ True or False / Fill-in the blanks (basic control concepts)** **Short questions** • Steady state error • Laplace transform • Roots locus basic concept (departure angle, intersection & angle of asymptotes, • j-axis cross point, break in or out point) • Maximum overshoot, settling time, rise formula • State matrix, stable or unstable (solve det[sI-A] to find eigenvalues) • **Tut 1 Q4-Q6** • **Tut 2 Q4-Q6** • **Tut 3 Q2, Q4, Q5, Q6, Q7** • **Tut 4 Q3** • **Tut 5 Q1** • **Tut 7 Q1, Q2** • **Tut 8 Q1, Q3** • **Tut 9 & 10 (Refer to pass exam paper questions)**
Part B **20%**	**6 Long questions** **1. Transfer function and State space model** State Space model, Transfer function derivation, electric circuit DC motor model, Second order time domain specification parameters (damping factor, natural freq.) **2. Time domain design & Steady state error analysis** Derive transfer function in terms of controller parameters Design parameters for given Mp, Ts, Tr **3. Feedback controller design for given Mp (or Ts & Tr)** **4. Ziegler and Nichols PID/ PI Controller Design** Given transfer function, derive critical gain and critical period Design ZN PI/PID **5. Root locus Design** Design region (zone for the desirable closed-loop poles) for given Mp, Ts &Tr Design phase lead controller (s+z)/(s+p) to make the root locus passing through a given in the design region **6. Frequency domain design** Bode plot, gain cross and phase cross frequency Design a phase lead controller