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**DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING**

**Subject: – LINEAR CONTROL SYSTEMS**

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| Faculty Name: G. Satish | Year / Sem: B.Tech in ECE 3/1 | Academic Year: 2020-21 |

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| **L. No** | **Name of the Topic** | **Reference Book** | **Delivery Method** |
| 1 | Basic concepts of simple control system | T1(2) | Chalk & Talk |
| 2 | Open loop control system with an example | T2(6) | Chalk & Talk |
| 3 | Closed loop control system with an example | T1(6-7) | Chalk & Talk |
| 4 | Effect of feedback on overall gain, stability, noise, sensitivity | T1(9-10)  T1(93) | Chalk & Talk |
| 5 | Types of feedback control system(LTI,TI, Non-linear) | T1(11-13) | Chalk & Talk |
| 6 | Brief detail on differential equations, Impulse response and transfer function | T1(62),W1  T1(27-28) | Chalk & Talk |
| 7 | Translational mechanical systems | T1(80-82), T2(27) | PPT |
| 8 | Problems on Translational mechanical systems | T1(80-82), T2(27) | Chalk & Talk |
| 9 | Rotational mechanical systems | T1(83-85), T2(32) | PPT |
| 10 | **Problems on** Rotational mechanical systems | T1(83-85), T2(32) | Chalk & Talk |
| 11 | **Force –voltage analogy** | W4 | PPT |
| 12 | **Force – current analogy** | W4 | PPT |
| 13 | Block diagram reduction technique | T1(46), T2(54-59) | PPT |
| 14 | Probelems on Block diagram reduction technique | T1(46), T2(54-59) | Chalk & Talk |
| 15 | Probelems on Block diagram reduction technique | T1(46), T2(54-59) | Chalk & Talk |
| 16 | Signal flow graphs | T1(48), T2(62-66) | PPT |
| 17 | Probelems on Signal flow graphs | T1(48), T2(62 | Chalk & Talk |
| 18 | Probelems on Signal flow graphs | T1(48), T2(62 | Chalk & Talk |
| 19 | DC servomotor | T2(49-54) | PPT |
| 20 | Ac servo motor | T2(138) | PPT |
| 21 | Synchro-transmitter and receiver | T2(148-151) | PPT |
| 22 | Standard test signals-impulse,step,ramp and parabolic | T1(234), T2(185-187) | Chalk & Talk |
| 23 | Impulse response function | T1(67) | Chalk & Talk |
| 24 | Characteristic polynomial & Characteristic equation of feedback systems | T2(254-255)  T2(282) | Chalk & Talk |
| 25 | Transient response of first order systems to standard test signals | T2(187-190) | Chalk & Talk |
| 26 | Transient response of second order systems to standard test signals | T2(190-194) | Chalk & Talk |
| 27 | Transient response of second order systems to standard test signals | T2(190-194) | Chalk & Talk |
| 28 | Time domain specifications | T2(194-201) | PPT |
| 29 | Expersions for Time domain specifications | T2(194-201) | Chalk & Talk |
| 30 | Steady state response, Steady state error, Error constants | T1(256)  T2(201)  T2(201-205) | Chalk & Talk |
| 31 | Steady state error for various types of inputs | T1(272) | Chalk & Talk |
| 32 | Problems on Steady state error | T1(272) | Chalk & Talk |
| 33 | Effect of adding poles and zeros on overshoot | T2(205-206),W3 | PPT |
| 34 | Effect of adding poles and zeros on rise time | T1(304-309)W2 | Chalk & Talk |
| 35 | Dominant poles of transfer function | T1(311) | Chalk & Talk |
| 36 | Absolute stability, relative stability, conditional stability | T2(255,267,254) | Chalk & Talk |
| 37 | BIBO stable system, zero input stability, Conditions for stability | T2(108-110)  T2(259) | Chalk & Talk |
| 38 | Routh-hurwitz criterion | T2(259-260) | PPT |
| 39 | Problems on Routh-hurwitz criterion | T2(259-260) | Chalk & Talk |
| 40 | Problems on Routh-hurwitz criterion | T2(259-260) | Chalk & Talk |
| 41 | Problems on Routh-hurwitz criterion | T2(259-260) | Chalk & Talk |
| 42 | Introduction to frequency domain analysis, Frequency domain specifications | T2(327)  T2(391-392) | Chalk & Talk |
| 43 | Estimation of Frequency domain specifications for second order systems | T2(391-392) | Chalk & Talk |
| 44 | Correlation between time domain and frequency domain responses | T2(328) | Chalk & Talk |
| 45 | Polar plots- Gain margin & Phase margin | T2(334-338)  T2(348),W3 | PPT |
| 46 | problems on polar plots | T2(348-349) | Chalk & Talk |
| 47 | problems on polar plots | T2(348-349) | Chalk & Talk |
| 48 | problems on polar plots | T2(348-349) | Chalk & Talk |
| 49 | Introduction to Bode plots | T2(338-348) | PPT |
| 50 | Problems on Bode plots | T1(455-458) | Chalk & Talk |
| 51 | Calculation of gain margin and phase margin | T1(457-458),W3 | Chalk & Talk |
| 52 | Problems on Bode plots | T1(455-458) | Chalk & Talk |
| 53 | Introduction to Nyquist contors | T2(358-361) | PPT |
| 54 | Nyquist stability criterion | T2(361-372) | Chalk & Talk |
| 55 | Relative stability using Nyquist stability criterion | T2(375-383) | Chalk & Talk |
| 56 | Closed loop frequency response | T1(410) | Chalk & Talk |
| 57 | Rules for constructing root locus | T2(277-279) | PPT |
| 58 | Assessing the stability using root locus | T2(297-300) | Chalk & Talk |
| 59 | Calculating the gain factor and frequency using root locus | T2(305-307) | Chalk & Talk |
| 60 | Problems on root locus | T2(297-300) | Chalk & Talk |
| 61 | Compensation techniques(lead and lag compensation) | T2(417-440) | PPT |
| 62 | State variable analysis- introduction | T2(548) | PPT |
| 63 | State, State variable, State model | T2(548-549) | Chalk & Talk |
| 64 | Diagonalization | T2(578) | Chalk & Talk |
| 65 | Solution of state equation | T2(584-590) | Chalk & Talk |
| 66 | State transition matrix | T2(585-588) | PPT |
| 67 | State model to LTI systems | T2(556-558) | Chalk & Talk |
| 68 | State space representation using physical variables | T2(557-558) | Chalk & Talk |
| 69 | Stare space representation using phase variables | T2(564-570) | Chalk & Talk |
| 70 | State space representation using canonical variables | T2(570-574) | Chalk & Talk |
| 71 | Concepts of controllability and observability | T2(596-603) | PPT |

**TEXT BOOKS**:

T1: B. C KUO, Automatic Control Systems,7th edition, PHI.

T2: I.J.Nagarath and M.Gopal, Control Systems Engineering, 3rd edition, New Age International.

T3: K.Ogata, Modern Control Engineering, 3rd edition, PHI.

**REFERENCE BOOKS:**

R1: Schaum Series, Feedback And Control systems.

R2: M.Gopal,Control Systems Principles and Design,Tmh.

R3: John Van De Vegata, Feedback Control Systems,3rd Edition,Prientice Hall,1993

**Web Resources:**

W1: https://books.google.co.in/books

W2:http://www.myclassbook.org/effects-of-addition-of-poles-and-zeros-to-closed-loop-transfer- function/

W3:http://ctms.engin.umich.edu/CTMS/index.php?example=Introduction&section=

ControlFrequency

W4: <https://www.tutorialspoint.com/control_systems/control_systems_electrical_analogies_>

mechanical.htm

**Signature of the faculty**