Code : 1G244 **R-11**

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES :: RAJAMPET
(AUTONOMOUS)

II B.Tech II Semester Regular Examinations April – 2013

Linear Control Systems
(Common to EEE & ECE)

Max. Marks: 70 **Time: 03 Hours**

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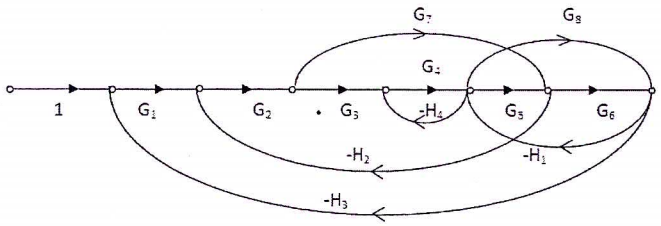
Answer *any five* questions
All Questions carry equal marks (14 Marks each)

1. a. Compare open loop and closed loop control systems. 7M
   b. Explain the effect of feedback on sensitivity. 7M
2. a. Explain the basic properties of signal flow graph. 6M
   b. Find the transfer function for the given signal flow graph. 8M



3. a. Derive the relations for time domain specifications of a second order system subjected to a unit step input 10M
   b. For a servomechanism represented by $\frac{d^2\theta}{dt^2} + 10\frac{d\theta}{dt} - 150e = 0$ where e = r – θ, is the actuating signal. Calculate the damping ratio, natural frequency and damped frequency of oscillations. 4M
4. a. Explain the relation between the location of roots in s-plane and system stability. 8M
   b. Applying Routh's criterion, find the range of k for stability of a system whose characteristic equation is given by $s^3+3ks^2+(k+2)s+4=0$ 6M
5. For a standard second order system, derive the expressions for various frequency domain specifications. 14M
6. Draw the Nyquist plot for the system whose open loop transfer function is $G(s)H(s) = \frac{k}{s(s+2)(s+10)}$. Determine the range of k for which closed loop system is stable. 14M
7. a. The open loop transfer function of a unity feedback control system is given by $G(s) - \frac{k}{s(1+0.5s)(1+0.1s)}$ .Compensate the system to meet the following specifications. 8M
   Velocity error constant of $K_v \geq 25\ s^{-1}$
   Phase margin $\varphi_s \geq 60^o$
   Bandwidth $\omega_b = 10$ rad/s
   b. Write short notes on PID controller. 6M
8. a. Explain the concept of controllability. 6M
   b. A transfer function of a control system is given by $G(s) = \frac{s+2}{s^3+9s^2+26s+24}$. Check for controllability and observability. 8M

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ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES :: RAJAMPET
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II B.Tech II Semester Regular April 2013

Pulse and Digital Circuits
(EEE)

Max. Marks: 70 **Time: 03 Hours**

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Answer *any five* questions
All Questions carry equal marks (14 Marks each)

1. a. Derive the expression for percentage tilt for a square wave output of RC high pass circuit. 8M

   b. A symmetrical square wave whose peak-to-peak amplitude is 2V and whose average value is zero is applied to an RC integrating circuit. The time constant is half the period of the square wave. Find the peak-to-peak value of the output amplitude. 6M

2. a. Compare series diode clipper and shunt diode clipper. 4M

   b. For the circuit shown in figure 2b, an input voltage V_i linearly varies from 0 to 150 V is applied. Sketch the output voltage V_0 to the same timescale. Assume ideal diodes. 10M

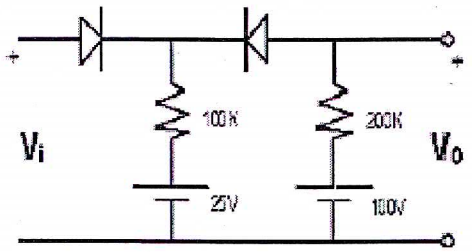

Figure 2b

3. a. Explain how transistor can be used as a switch in the circuit, under what condition a transistor is said to be 'OFF' and 'ON' respectively. 8M

   b. A transistor has fT= 50 MHz, hFE=40, $C_{b'c}$ =3PF and operates with Vcc=12V and Rc=500Ω . The transistor is operating initially in the neighbourhood of the cut-in point. What base current must be applied to drive the transistor to saturation in 1μ sec? 6M

4. a. Derive an expression for the o/p gate width of a transistor mono stable multi vibrator. 8M

   b. A collector coupled Fixed bias binary uses NPN transistors with h_{FE}= 100. The circuit parameters are V_{CC}= 12v, V_{BB}= -3v, R_C= 1kΩ, R_1= 5kΩ ,and R_2= 10kΩ . Verify that when one transistor is cut-off the other is in saturation. Find the stable state currents and voltages for the circuit. Assume for transistors V_{CE}(sat) = 0.3V and V_{BE}(sat) = 0.7V. 6M

5. a. Draw the circuit of a two-stage transistor bootstrap circuit to get an exactly linear sweep. 8M

   b. Derive the expression , Mathematical relationship between sweep speed error, Displacement error, and transmission error for an exponential sweep circuit. 6M

6. a. Illustrate the principle of sampling gate with series and parallel switched and compare them. 7M

   b. Explain the operation of Six-diode sampling gate. 7M

7. a. Explain the method of pulse synchronization of relaxation devices, with examples. 8M

   b. A free-running relaxation oscillator has sweep amplitude of 100 V and a period of 1msec synchronizing pulses are applied to the device such that breakdown voltage is lowered by 50V at each pulse. The synchronizing pulse frequency is 4 kHz. What is the amplitude and frequency of synchronized oscillator wave form? 6M

8. a. Draw the circuit diagram and explain the working of a diode transistor logic gate. 7M

   b. Draw and explain the circuit diagram of integrated positive RTL NOR gate. 7M

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II B.Tech II Semester Regular April 2013

Electrical Circuits-II
(EEE)

Max. Marks: 70 **Time: 03 Hours**

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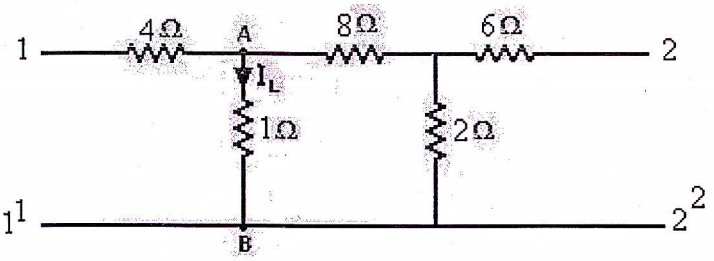
Answer *any five* full questions
All Questions carry equal marks (14 Marks each)

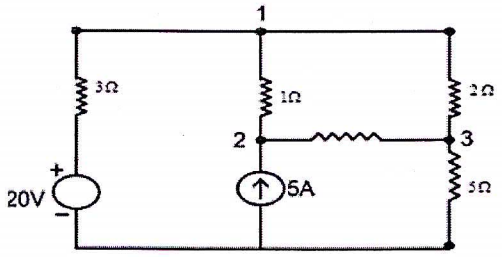
1. a. Derive the relation ship between Y- parameters and Z- parameters **7**

   b. Find the transmission parameters of the network shown below. **7**

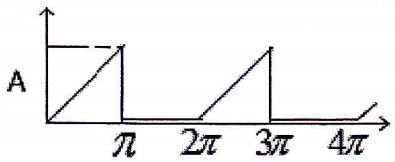


2. a. Write the properties of tie-set matrix and cut-set matrix **6**

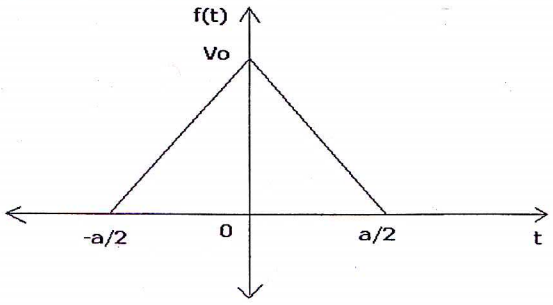
   b. Using nodal analysis, find the power dissipated in the 6Ω resistor for the circuit shown infig **8**



3. a. Find the fouries series of the given wave form. **7**



   b. Find the continuous magnitude and phase spectra of the waveform shown in fig. **7**



4. a. Explain Impulse Response of R-L Series Network 7

   b. Find the Inverse Laplace Transform of $F(s) = \frac{(s-1)}{s(s+1)^3}$ 7

5. a. Derive the expression for transient response of RLC Series circuit with unit step unit. 7

   b. In a series RLC circuit, R=5ohms, L=1H and C=1F. A DC voltage of 20V is applied at t=0 obtain i(t). 7

6. a. Derive an expression for the current response in RC series circuit with an sinusoidal source. 7

   b. A Series RL circuit with R=50Ω and L=0.2H has a sinusoidal voltage source V=150 sin(500t+Φ) volts applied at a time when Φ=0. Find the expression for total current. 7

7. a. Write the necessary conditions for a transfer function 7

   b. A driving point impedance is given by $Z(s) = \frac{s^2-7s+10}{s^2+s+50}$. Find pole zero plot 7

8. a. Explain procedure of testing of Passive real functions 7

   b. Check the Passive realness of the Function $Y(s) = \frac{s^2+2s+20}{s+10}$. 7

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II B.Tech II Semester Regular April 2013

Electrical Machines-II
(EEE)

Max. Marks: 70 **Time: 03 Hours**

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Answer *any five* questions
All Questions carry equal marks (14 Marks each)

1. a. Define a transformer. How is the energy transferred from one circuit to the other? Distinguish between step up and step down transformers. 7M

   b. A 3300/500V,50Hz single phase transformer is built on a core having an effective cross-sectional area of 225cm^2 and 70 turn on the low-voltage handing calculate

   (i) The valve of maximum flux density.

   (ii) The no. of turn on high voltage winding. 7M

2. a. How all day efficiency is different for full load efficiency? Give the various losses considered in calculating all day effciency? For which type of transformer it is important. 5M

   b. The efficiency at unity power factor of 6600/384 volts, 100 KVA, 50 Hz single phase transformer is 98% both at full load and at half full load. The power factor on no load is 0.2 and the full load regulation at a lagging power factor of 0.8 is 4%. Draw the equivalent circuit referred to L.V. side and insert all the values. 9M

3. a. A 50 KVA, 2200/110 V, transformer when tested gave the following results

   OC test(lv side) : 400 W, 10 A, 110 V

   SC test(hv side) : 808 W, 20.5 A, 90 V

   Calculate:(a) the equivalent circuit parameters when refered to h.v. side. 10M

   b. The eefficiency at full load with 0.8 power factor lagging. 4M

4. a. Discuss in detail about on-load tap changing of transformers. 7M

   b. Write about Scott connection of transformer. 7M

5. a. With a neat diagram, explain the construction and operation of 3-Φ Induction motor. 7M

   b. The rotor resistance per phase of an 8 pole a 50Hz slip ring motor is 0.25 ohm and its full load speed is 720rpm. Calculate the external resistance per phase that must be added to the lower speed to 600 rpm. Given that torque is same in two cases. 7M

6. a. With neat diagram the explain Torque-Slip characteristics of Induction motor 7M

   b. A 3-Φ, 50 Hz, 4 pole slip ring IM gives a reading of 120 V across slip rings on open circuit, when at rest and supplied with normal supply voltage. The rotor impedance per phase is 0.3+ j1.5 Ω. Find the rotor current and torque when machine is running at 5 % slip. 7M

7. A 3- Φ,Δ connected,18.65kW,440V,50Hz slip ring IM gave the following test results: 14M
No load Test: 440 V, 7.5 A, 1350 W (Including 650 W friction loss)

Blocked rotor test: 100 V, 32 A, 1800W

All above are the line values. Plot the circle diagram and for full load nd:

(a) The line current (b) The power factor (c) Slip

(d) Torque (e) Efficiency (f) Maximum Power factor

Given that rotor copper losses are equal to stator copper losses at stand still.

8. a. Explain the principle of operation of induction generator. 7M

b. Explain briefly the different methods of speed control from rotor side of 3 phase induction motor 7M

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II B.Tech II Semester Regular Examinations April – 2013

Generation of Electric Power
(EEE)

Max. Marks: 70 **Time: 03 Hours**

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Answer *any five* full questions
All Questions carry equal marks (14 Marks each)

1. a. What are the essential requirements of Steam Power Station Design? 7M
   b. Explain the function of Economiser, Condenser and Super heater in a thermal power station? 7M
2. a. Draw a neat schematic diagram of a Hydro-electric plant and explain the functions of various components? 8M
   b. Discuss the merits and demerits of a Hydro-electric plant? 6M
3. a. What is nuclear fusion? How does it differ from nuclear fission? 6M
   b. Explain the working of Gas power plant with a schematic diagram? 8M
4. a. Discuss the relative merits and demerits of underground and overhead systems? 6M
   b. A 2-wire dc ring distibutor is 300m long and is fed at 230V at point A. At point B, 150m from pointA, a load of 100A is taken and at C, 100m in the opposite direction, a load of 80 A is taken. If the resistance per 100m of single conductor is 0.03ohm. Find (i) current in each section (ii) Voltage at pont B&C. 8M
5. a. Draw the phasor diagram of AC distributor power factor with respect to load voltages. 6M
   b. A single phase line (ABC) of length 2Km having resistance and reactance (go and return) as 0.06 and 0.1 ohm/Km. A is the feeding point, B is the mid point of the line taking a load of 100A at 0.9 p.f. leads and C is the far end taking a load of 120A at UPF.The voltage at the C is 230V. Find the voltage at the sending end and the phase angle difference between the voltages of two ends if power factors of the loads are with reference to far end voltage. 8M
6. a. Briefly discuss the classification of substations? 8M
   b. Give the comparision between Gas insulated and Air insulated substations? 6M
7. a. A power station has a maximum demand of 12MW, a load factor of 60%, plant capacity factor of 50% and plant use factor of 72%. Find (i) Reserve Capacity
   (ii) Maximum energy that could be produced daily if the plant while running as per schedule were fully loaded. 8M
   b. Explain different types of power factor Tariff? 6M
8. a. Explain the various methods for power factor improvement? 10M
   b. What are the causes of low power factor? 4M

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