Code : 1G244

R11

II B.Tech. II Semester Supplementary Examinations December, 2014

Linear Control Systems

(Common to EEE & ECE)

Time: 3 hours **Max Marks: 70**

Answer any FIVE of the following

All questions carry equal marks (14 Marks each)

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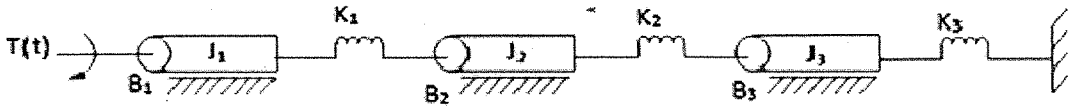
1. a) Explain the effect of feedback on transient response. 6M

   b) For the system shown below, write the differential equations of performance. Also draw the analogous electric circuit. 8M



2. a) Explain how the synchro transmitter and synchro control transformer can be used as an error detector. 7M

   b) Derive the transfer function of A.C servomotor 7M

3. a) Define the various time domain specifications. 7M

   b) Derive the expression for peak time for a standard second order system. Assume the system is under damped. 7M

4. Sketch the root locus plot for all values of K ranging from 0 to infinity for a negative feedback control system characterized by $G(s)H(s) = \frac{k(s+6)}{s(s+1)(s+2)}$. 14M

5. Using Bode plot, investigate the stability of a negative feedback control system whose open loop transfer function is given by $\frac{50}{s(1+0.5s)(1+0.05s)}$ 14M

6. Check the stability of the system by Nyquist criterion, $G(s) = \frac{10}{s^2(1+0.2s)(1+0.5s)}$ 14M

7. a) What is a lag compensator? Obtain its transfer function and draw its Pole-Zero plot. 7M

   b) Explain the different steps to be followed for the design of lag compensator using Bode plot? 7M

8. a) Derive an expression for the solution of a non-homogeneous state equation. 7M

   b) A third order system has the following coefficient matrices.

$$A = \begin{bmatrix} 1 & 2 & 1 \\ 0 & 1 & 0 \\ 1 & -4 & 3 \end{bmatrix}; \quad B = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}.$$ Determine the state controllability. 7M

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Code : 1GC41 **R-11**

II B.Tech. II Semester Supplementary Examinations December 2014

Mathematics-III

(Common to EEE & ECE)

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

Answer *any five* questions

All Questions carry equal marks (14 Marks each)

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1. a) Show that $\int_0^\infty \frac{x^{m-1}}{(x+a)^{m+n}}dx = a^{-n}\beta(m,n)$ 7M

   b) When n is a positive integer, show that $\Gamma(n)\Gamma(n+\frac{1}{2}) = \frac{\Gamma(2n)\sqrt{\pi}}{2^{2n-1}}$ 7M

2. a) If $f(z)$ is an analytic function, show that $\left\{\frac{\partial}{\partial x}|f(z)|\right\}^2 + \left\{\frac{\partial}{\partial y}|f(z)|\right\}^2 = |f'(z)|^2$ 7M

   b) Find the analytic function $f(z)$ such that $\mathrm{Re}[f'(z)] = 3x^2 - 4y - 3y^2$ and $f(1+i) = 0$. 7M

3. a) Separate the real and imaginary parts of (i) cot z and (ii) cosec z 7M

   b) If $\tan\left(\frac{\pi}{6} + i\alpha\right) = x + iy$, prove that $x^2 + y^2 + \frac{2x}{\sqrt{3}} = 1$ 7M

4. a) Evaluate $\int_0^{1+i} (x - y + ix^2)dz$ along real axis from z = 0 to z = 1 and then along the line parallel to imaginary axis from z = 1 to z = 1 + i. 7M

   b) Evaluate $\int_C \frac{\sin^2 z}{(z-\frac{\pi}{6})^3}dz$ where C is the circle $|z| = 1$ using Cauchy integral formula. 7M

5. a) Obtain Taylor series expansion of $f(z) = \frac{e^z}{z(z+1)}$ about z = 2. 7M

   b) Find all possible regions for which the function $f(z) = \frac{7z-2}{z(z+1)(z-2)}$ has a valid Laurent series expansion about $z = -1$ and expand the function in Laurent series in the region $1 < |z + 1| < 3$ 7M

6. a) Evaluate $\int_C \frac{dz}{\sinh z}$ where C is the circle | z | = 4 using Residue theorem. 7M

   b) Using complex variable technique show that $\int_0^\infty \frac{dx}{(1+x^2)^2} = \frac{\pi}{4}$ 7M

7. a) Determine the number of roots of the equation $2z^5 - 6z^2 + z + 1 = 0$ in the region $1 \le |z| < 2$ 7M

   b) State and prove the fundamental theorem of algebra. 7M

8. a) Show that the relation $w = \frac{5-4z}{4z-2}$ transforms the circle | z | = 1 into a circle of radius unity in w – plane. 7M

   b) Find a Bilinear transformation which maps the points $z = 1, i, -1$ onto the points $w = 0, 1, \infty$. 7M

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Code : 1G341

R11

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

II B.Tech. II Semester Supplementary Examinations December, 2014

Signals and Systems

(ECE)

Time: 3 hours **Max Marks: 70**

Answer any FIVE of the following
All questions carry equal marks (14 Marks each)

* * * * *

1. A rectangular function *f(t)* is defined as

$$f(t) = \begin{cases} 1, (0 < t < \pi) \\ -1, (\pi < t < 2\pi) \end{cases}$$

Approximate this function by the algebraic sum *a sin t + b sin 2t* over the interval *(0,2π)* such that the mean square error is minimum. 14M

2. Plot $g_p(t)$ for $|t|<3$ and find the first three terms in the Fourier series expansion of the periodic sequence $g_p(t)$ consisting of raised cosine pulses with period $T_0=2$ as defined by

$$g_p(t) = \begin{cases} 1+\cos(2\pi t), & |t|<\frac{1}{2} \\ 0, & \frac{1}{2}<|t|<1 \end{cases}$$ 14M

3. Explain the duality and differentiation in time domain properties of Fourier transforms. Using these properties define and derive the expression for the Gaussian pulse. 14M

4. a) Explain Hilbert transform and its properties. 10M

   b) Determine the Hilbert transform of $g(t) = \cos(2\pi f_c t)$ 4M

5. Determine and sketch the auto correlation functions of

   a) $g(t) = e^{-a|t|}$ 7M

   b) $g(t) = e^{-at}u(t) - e^{at}u(-t)$ 7M

6. a) Explain Sampling theorem. 10M

   b) Explain Aliasing. 4M

7. a) Determine the inverse Laplace transform of

   $X(s) = \frac{s+2}{s^2+8s+15}$ with ROC Re{s} < -5 4M

   b) Find the impulse response of the causal system described by the differential equation

   $$\frac{d^2y(t)}{dt^2} + 3\frac{dy(t)}{dt} + 2y(t) = x(t)$$ 10M

8. a) Determine the z-transform and ROC of

   $$x[n] = \left(\frac{1}{4}\right)^n \sin\left(\frac{\pi}{4}n\right)u[n]$$ 7M

   b) Find the sequence whose z-transform is

   $X(z) = \log(1 + az^{-1}), \quad |z| > |a|$ 7M

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Code : 1G246

R11

II B.Tech. II Semester Supplementary Examinations December, 2014

Electrical Technology

(Electronics & Communication Engineering)

Time: 3 hours **Max Marks: 70**

Answer any FIVE of the following

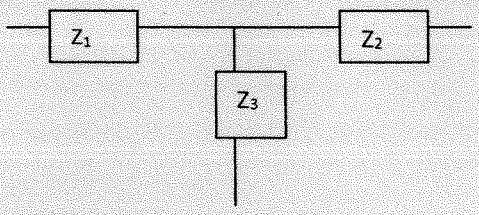
All questions carry equal marks (14 Marks each)

* * * * *

1. a) Define the time constant of R-L circuit. Give its significance. 6M

   b) The series RLC circuit is excited by dc voltage of V, determine the expression for i(t). The switch is closed at t=0. Take V=1V; R=2ohms; L=1H and C=0.5F. 8M

2. a) In a T network shown, $Z_1 = 26 \angle 0^\circ$, $Z_2 = 56 \angle 90^\circ$, $Z_3 = 36 \angle 90^\circ$, find the Z-parameters.



7M

   b) Z-parameters for a two port network are given as $Z11$=25-, $Z12$=$Z21$=20-, $Z22$=50-. Find the equivalent T-network. 7M

3. Design the T- section of an m- derived high pass filter having a design impedance of 300 ohms and cutoff frequency of 2000Hz. The frequency of infinite attenuation is 1700Hz. 14M

4. Derive the expressions for attenuation constant, phase constant, cut-off frequency and characteristic impedance of a symmetrical π – Section. 14M

5. Discuss the process of self-excitation in a dc machine. What conditions must be fulfilled for the machine to self-excite. 14M

6. a) Draw and explain different characteristics of dc shunt and series motor. 8M

   b) A 220V d.c. shunt motor runs at 500 rpm when the armature current is 50A. Calculate the speed if the torque is doubled. Given that ra = 0.2 ohms. 6M

7. a) Explain different losses present in a transformer. 7M

   b) The primary and secondary windings of a 500kVA transformer have resistances of 0.42 ohm and 0.0019 ohms respectively. The primary and secondary voltages are 11kV and 415V respectively and the core loss is 2.9kW, assuming the power factor of the load to be 0.8. Calculate the efficiency on full load. 7M

8. a). What is a two phase servo motor? Where it is used? Show its connection diagram. Draw its torque speed curve. 7M

   b). Draw a diagram showing the construction of a stepper motor and discuss its operation briefly. 7M

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Code : 1G245 **R11**

II B.Tech. II Semester Supplementary Examinations December. 2014

Switching Theory and Logic Design

(ECE)

Time: 3 hours **Max Marks: 70**

Answer any FIVE of the following
All questions carry equal marks (14 Marks each)

* * * * *

1. a) Convert the Hexadecimal number 1010 to Decimal and then to Binary. 4M
   b) Convert Decimal number 24.6 to Binary number. 3M
   c) Encode the binary word 1101 into seven bit even-parity hamming code. 4M
   d) What are the advantages and disadvantages of using 2's complement notation in binary arithmetic? 3M
2. a) Simplify the following Boolean functions to minimum number of literals.
      i. x'+y'+xyz'
      ii. (x'+xyz') + (x'+xyz') (x'+x'y'z) 4M
   b) Convert the following expressions into sum of products and product of sums.
      i. (AB+C) (B+C'D)
      ii. x'+x(x+y')(y+z') 4M
   c) What are universal gates? Realize X-OR operation using only NAND and NOR gates. 6M
3. Minimize the following functions using Tabular minimization and verify the same with K-map minimization.
   $F = \sum m (0, 1, 6, 7, 8, 9, 13, 14, 15)$ 14M
4. a) Implement the following Boolean function using 8:1 MUX considering "D" as the input and A, B, C as selection lines.
      F (A, B, C, D) = AB'+BD+B'CD' 9M
   b) Realize Full adder using two half adders and logic gates. 5M
5. a) What is PAL? How it differs from PROM & PLA? 4M
   b) Implement the following two Boolean functions with PLA.
      $F_1 (A, B, C) = \sum (0, 1, 2, 4)$
      $F_2 (A, B, C) = \sum (0, 5, 6, 7)$ 10M
6. a) What is race around condition? How it is avoided? 4M
   b) Give the transition tables for the SR-flip flop and also give the comparison between Combinational & Sequential circuits. 10M

7 a) What is Moore & Mealy machine? Compare them. 4M

b) Convert the following Mealy machine into a corresponding Moore machine:

PS	NS, Z	
	X=0	X=1
A	C,0	B,0
B	A,1	D,0
C	B,1	A,1
D	D,1	C,0

10M

8. a) What is the difference between Flow chart & ASM chart? 4M

b) Draw the State diagram, State table and ASM chart for a 2-bit binary counter having one enable line 'E' such that E=1 counting enabled and E=0 counting disabled. 10M

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Code : 1G342

R11

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES :: RAJAMPET

(AUTONOMOUS)

II B.Tech. II Semester Supplementary Examinations December, 2014

Electromagnetic Waves and Transmission Lines

(ECE)

Time: 3 hours **Max Marks: 70**

Answer any FIVE of the following

All questions carry equal marks (14 Marks each)

* * * * *

1. a) Define the electric potential and derive the equation for the electric potential?

   b) A point charge 5 nC is located at the origin. If V = 2 volts at (0,6,-8), find

      (i) The potential at A(-3,2,6)

      (ii) The potential at B(1,5,7)

      (iii) The potential difference V_{AB}

2. a) Define and explain conduction and convection currents?

   b) For the current density $J = 10z\sin^2\phi a_\rho$ A/m^2 find the current through the cylindrical surface defined by $\rho = 2$, $1 \le Z \le 5$ m.

3. a) Define the magnetic flux density and obtain the two Maxwell's equations for magneto static fields?

   b) A current distribution gives rise to the magnetic vector potential

      $A = x^2 y a_x + y^2 x a_y - 4xyz a_z$ wb/m. Calculate

      (i) B at (-1,2,5)

      (ii) The magnetic flux through the surface defined by $z = 1, 0 \le x \le 1, -1 \le y \le 4$

4. a) Write the Maxwell's equations for the time varying fields and give their word statement?

   b) In free space $E = 20\cos(\omega t - 50x)a_y$ V/m Calculate

      (i) Displacement current density (J_d)

      (ii) Magnetic field intensity (H)

      (iii) Angular frequency(ω)

5 a) Define "skin depth" and derive the equation for skin depth?

   b) A plane wave in a nonmagnetic medium has $E = 50\sin(10^8 t + 2z)a_y$ V/m find

      (i) The direction of wave propagation

      (ii) λ, f, and ε_r

      (iii)H

6. a) Define and explain the following terms
   (i) Direction cosines
   (ii) Brewster angle

   b) In free space($z \le 0$) , a plane wave with

$$E = 20\sin\left(10^8 t - \beta z\right)a_x \ \text{V/m}$$

   is incident normally on lossless medium with $\varepsilon = 2\varepsilon_0, and \mu = 8\mu_0$ and in region $z \ge 0$, determine the reflected and transmitted fields of E and H

7. a) Define the primary and secondary constants of a transmission line and also draw the equivalent circuit of a lossy transmission line?

   b) Calculate the characteristic impedance, propagation constant and velocity of propagation at 400 KHz for a transmission line having $L = 0.5mH/km, C = 0.08\mu F/km$ and negligible R & G

8. a) Define and explain the following terms
   (i) Reflection coefficient
   (ii) Voltage Standing Wave Ratio(VSWR)

   b) A transmission line of characteristic impedance 50Ω is terminated by a load of 100Ω. What will be the VSWR on the line? Calculate the impedance at the voltage Maximum and Minimum positions.

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