Code : *1G246*

R-11

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

II B.Tech II Semester Regular Examinations April – 2013

Electrical Technology
(ECE)

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

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

1. In a series RLC circuit switch is closed at time t=0. The value of R=20 ohms, L=1 H, C=10 μF. The circuit is exited by 50 V source. Find $i(0)^+$, $di/dt\ (0^+)$ and $d^2i/dt^2\ (0^+)$ 14M

2. a) Derive the relation between 'Impedance' and 'Admittance' parameters. 7M

   b) The Z-parameters of a two port network are Z_{11}=10 ohms, Z_{22}=20 ohms, Z_{12}=Z_{21}=5 ohms. Find the hybrid parameters of the network, and the equivalent T-network. 7M

3. a) Briefly discuss the classification of Filters. 8M

   b) Design constant k-low pass filter having cut off frequency of 3000 Hz and nominal Impedance of 600 ohms. 6M

4. a) What is an attenuator? Derive the design equations for T-type attenuator. 7M

   b) Design ∏-type attenuator to provide the attenuation of 15 dB. Take characteristic Impedance = 200 ohms. 7M

5. a) Explain the constructional details of DC machine. 8M

   b) A 6 – pole, Lap wound armature has 840 conductors and flux per pole of 0.018 Wb. Calculate the emf generated when the machine is running at 600 rpm. 6M

6. a) Explain the principle of operation of DC motors. 7M

   b) The armature of a 6 –pole, 6 circuit DC shunt motor takes 300 A at speed of 400 rpm. The flux per pole 75 mWb. The number of armature turns is 500. The torque lost in windage, friction and iron losses can be assumed as 2.5 %. Calculate (i) The torque developed by the armature (ii) The shaft torque. 7M

7. a) Explain open circuit and short circuit test conducted on single phase Transformers with neat circuit diagrams. 7M

   b) A single phase transformer working at unity power factor has an efficiency of 90 % at both one half load and at the full load of 500 W. Determine the efficiency at 75 % of full load. 7M

8. Explain the principle of operation and characteristics of
   (a) AC Tacho meters (b) Stepper motor 14M

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Code : 1G342 **R-11**

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

II B.Tech II Semester Regular April 2013

Electromagnetic Waves and Transmission Lines
(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) State Gauss's law. Apply Gauss law for uniformly charged sphere to find Flux Density D. 7M
   b) Find Electric field intensity at a point p along the axis of a circular disc which is charged uniformly with a surface charge density σ and subtending an angle 2d at p. 7M
2. a) Derive equations for Resistance and Capacitance in case of Spherical capacitor. 9M
   b) Explain general procedure for solving Poisson's or Laplace's equation? 5M
3. a) Find magnetic field intensity due to straight current carrying element. 7M
   b) Determine self inductance of a coaxial cable of inner radius a and outer radius b. 7M
4. a) find $\Delta \times E$ for transformer and motional EMF 8M
   b) In free space, $E = 20\ \mathrm{Cos}(\omega t - 80x)a_y$ V/m. Calculate (i) J_a (ii) H (iii) ω 6M
5. a) Derive equation for uniform plane waves in lossy dielectrics. 7M
   b) A lossy dielectric has an intrinsic impedance of $200\ \angle 30^0$ at a particular radian frequency ω. If at that frequency, the plane wave propagating through the dielectric has the magnetic field component 7M
   $H = 10\ e^{-\alpha x} \cos(\omega t - 0.5x)\ a_y$ A/m.
   Find E and α. Determine the skin depth and wave polarization.
6. a) State and prove Poynting theorem. 7M
   b) In a non-magnetic medium 7M
   $E = 4 \sin(2\pi \times 10^7 t - 0.8x)\ a_z$ V/m.
   Find (i) ε_r, η (ii) the time average power by the wave
7. a) What is line distortion? Derive the condition for distortionless line? 7M
   b) The primary constants of a telephone cable are; R=10 Ω per loop km, C= 0.04 μF per loop km, at a frequency of 1kHz the effect of L and G of the cable are negligible. The telephone cable is now loaded with coils each of L =100 mH and R = 12 Ω at interval of 0.9km. Calculate the decrease in attenuation due to loading and approximate value of the cutoff frequency. Also find the values of phase velocities of propagation at 1KHz before and after loading. 7M
8. a) What is stub matching. Derive the susceptance that should be added by the stub and length of the short circuit stub? 7M
   b) Explain applications of Smith chart in detail. 7M

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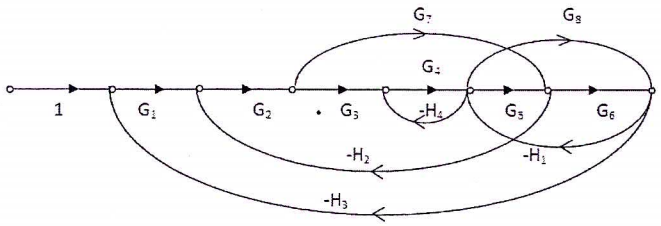
Answer *any five* questions
All Questions carry equal marks (14 Marks each)

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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Code : 1GC41 **R-11**

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

II B.Tech. II Semester Regular Examinations April – 2013

Mathematics- III

(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. Prove that $\beta(m,n) = \int_0^1 \frac{x^{m-1} + x^{n-1}}{(1+x)^{m+n}} dx$

   b. State and prove the relationship between β and Γ functions.

2. a. Show that the function $f(z) = \sqrt{|xy|}$ is not analytic at origin although Cauchy – Riemann equations are satisfied at that point .

   b. Find an analytic function whose real part is $e^{-x}(x \sin y - y \cos y)$

3. a. Separate the real and imaginary parts of (i) Tan z and (ii) Sinh z

   b. Find all solutions of the equation $e^z = 3 + 4i$

4. a. Evaluate $\int f(z)\,dz$ where $f(z) = x^2 + i\,xy$ from A(1,1) to B (2,8) along the curve $x = t$ and $y = t^3$.

   b. Evaluate $\int_C \frac{e^{2z}}{(z+1)^4} dz$ where C is the curve $|z-1| = 4$ using Cauchy's integral formula.

5. a. Find the Laurent expansion of $f(z) = \frac{1}{(1-z)(z-2)}$ in the regions $1 < |z| < 2$ and $|z| > 2$

   b. Show that $\frac{1}{z^2} = \frac{1}{4} + \frac{1}{4}\sum_{n=1}^{\infty} (-1)^n (n+1)\left(\frac{z-2}{2}\right)^n$ if $|z-2| < 2$.

6. a. State and prove Residue theorem

   b. Applying the calculus of residues show that $\int_0^{2\pi} e^{\cos\theta} \cos(\sin\theta - n\theta) d\theta = 2\pi / n!$ where n is a positive integer.

7. a. State Rouche's theorem and show that all the zeros of $z^7 - 5z^3 + 12 = 0$ lie between the circles $|z| = 1$ and $|z| = 2$

   b. Evaluate $\int_C \frac{f'(z)}{f(z)} dz$ where $f(z) = \frac{z^2 - 1}{(z^2 + z)^2}$ and C is the circle $|z| = 2$

8. a. Find the image of the infinite strip $0 < y < \frac{1}{2}$ under the transformation $w = \frac{1}{z}$

   b. Find a bilinear transformation that maps the points (0, 1, ∞) in z – plane onto the points (– 1, – 2, – i) in the w – plane.

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Code : 1G341

R-11

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

II B.Tech II Semester Regular April 2013

Signals and Systems
(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) Prove that sinusoidal functions are orthogonal functions 6M
   b) Define and sketch the:
   (i) Impulse function. (ii) Unit Step function.
   (iii) Ramp function. (iv) Signum function. 8M
2. a) State the properties of complex Fourier series. 6M
   b) Determine the Fourier series of the function shown in below figure 1

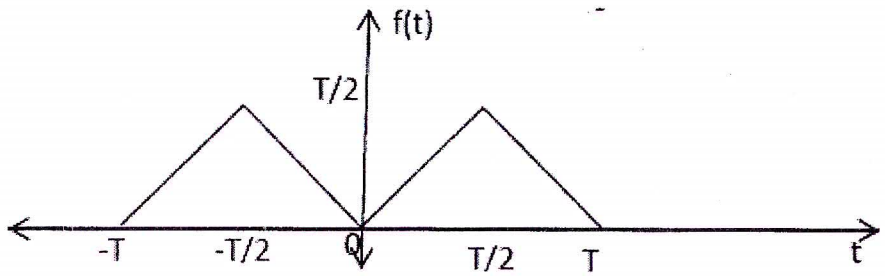

figure 1 8M

3. a) Find the Fourier transform of symmetrical triangular pulse and sketch the Spectrum. 7M
   b) State and prove symmetry property of Fourier transform. 7M
4. a) Discuss the Poly-wiener criterion for physical realization of systems. 7M
   b) Compare signal bandwidth and system bandwidth. 7M
5. a) Distinguish natural and flat top samplings. 6M
   b) Determine the minimum sampling rate and Nyquist interval of Sin (100t)+Sin(1000t). 8M
6. a) Explain briefly detection of periodic signals in the presence of noise by correlation 7M
   b) Explain briefly extraction of a signal from noise by filtering 7M
7. a) State and prove the properties of Laplace transforms. 7M
   b) Derive the relation between Laplace transform and Fourier transform of signal. 7M
8. a) Determine z- transform, pole-zero locations and sketch of ROC of following signal
   $x(n) = (1/2)^n u(n) + (-1/3)^n u(n)$ 7M
   b) Find the inverse z-transform of
   $X(z) = 1 - z - 1 + z - 2 / (1 - 0.5z - 1)(1 - 2z - 1)(1 - z - 1)$
   With ROC of $1 < |z| < 2$ 7M

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Code : 1G245

R-11

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

II B.Tech II Semester Regular April 2013

Switching Theory and Logic Design
(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) Convert the following decimal numbers to binary: 1231; 673.23; 10^4 and 1998. 8M
   b) Given the binary numbers a=1010.1, b=101.01, c=1001.1, perform a-b and a*c. 6M
2. a) Simplify the following Boolean expressions to a minimum number of literals. 7M
   (i) x'yz'+x'y'z'+xy'z'+x'yz+xyz+xy'z (ii) x'z'+y'z'+yz'+xyz
   b) Implement the following function using only NAND gates G=(a+b')(cd+e') 7M
3. a) Simplify the following Boolean function using five-variable maps: 10M
   F=A'B'CE'+A'B'C'D'+B'D'E'+B'CD'+CDE'+BDE'
   b) Simplify the following Boolean function using four-variable maps: 4M
   F(A,B,C,D) = Σ(3,7,11,13,14,15)
4. a) Implement the following Boolean function with an 8 X 1 multiplexer 7M
   F(A,B,C,D) = Σ(0,3,5,6,8,9,14,15)
   b) Design a logic circuit with 4 inputs A,B,C,D that will produce output 1 only whenever two adjacent input variables are 1s, A and D are also to be treated as adjacent. Implement it using universal logic gates. 7M
5. Design a 4 input priority encoder in ROM and PAL. 14M
6. Define state table. Draw state table for a 4-bit synchronous UP/DOWN counter. Design UP/DOWN synchronous counters. 14M
7. a) Explain the procedure of state minimization using the partition technique. 4M
   b) Determine minima state equivalent of the state table shown below. 10M

PS	NS,Z	
	x=0	x=1
A	A,0	E,1
B	A,1	E,1
C	B,1	F,1
D	B,1	F,1
E	C,0	G,0
F	C,0	G,0
G	D,0	H,0
H	D,0	H,0

8. a) Compare the ASM chart and the state diagram. 4M
   b) Draw the state diagram, state table, and ASM chart for a 3 bit up-down counter having mode control input. M = 1 up counting, M = 0 down counting. The circuit should generate a output 1 whenever count becomes minimum or maximum. 10M

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