Code : 1GC41 **R11**

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES :: RAJAMPET
(AUTONOMOUS)
II B.Tech. II Semester Supplementary Examinations, Jan/Feb 2014
Mathematics–III
(Common to EEE & ECE)

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

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

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

   b) Show that $\int_0^\infty x^n e^{-a^2x^2}dx=\frac{1}{2a^{n+1}}\Gamma(\frac{n+1}{2}),(n>-1)$ and hence find the value of $\int_{-\infty}^{\infty} e^{-a^2x^2}dx$ 7 M

2. a) If f(z) is a regular function of z, prove that $(\frac{\partial^2}{\partial x^2}+\frac{\partial^2}{\partial y^2})|f(z)|^2=4|f'(z)|^2$ 7 M

   b) If $f(z)=u+iv$ is an analytic function of z and if $u-v=e^x(\cos y-\sin y)$, find f(z) in terms of z. 7 M

3. a) If $\sin(A+iB)=x+iy$ then show that $x^2\cos ec^2A-y^2\sec^2A=1$ 7 M

   b) Find all the roots of the equation Tanh z + 2 = 0 7 M

4. a) Integrate $f(z)=x^2+ixy$ from A (1,1) to B (2,8) along the curve 'c' given by $x=t, y=t^3$ 7 M

   b) Evaluate $\int_C \frac{z^3-\sin 3z}{(z-\frac{\pi}{2})^3}dz$ with C : $|z|=2$ using Cauchy's integral formula. 7 M

5. a) Obtain Taylor series to represent the function $\frac{z^2-1}{(z+2)(z+3)}$, in the region $|z|<2$ 7 M

   b) Find the Laurent series of $\frac{7z-2}{(z+1)z(z-2)}$ in the annulus $1<|z+1|<3$ 7 M

6. a) Evaluate $\int_C \frac{e^z}{(z^2+\pi^2)^2}dz$ where C is $|z|=4$ using Residue theorem. 7 M

   b) Evaluate $\int_0^{2\pi} \frac{d\theta}{(5-3\sin\theta)^2}$ using the method of contour integration. 7 M

7. a) Use Rouche's theorem to show that the equation $z^5+15z+1=0$ has one root in the disc $|z|<\frac{3}{2}$ and four roots in the annulus $\frac{3}{2}<|z|<2$. 7 M

   b) State and prove Fundamental theorem of Algebra. 7 M

8. a) Under the transformation $w=\frac{1}{z}$ find the image of the circle $|z-2i|=2$ 7 M

   b) Find a bilinear transformation which maps the points (– 1 , 0 , 1) into the points (0 , i , 3i) . 7 M

****

Code : 1G341 **R-11**

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

II B.Tech. II Semester Supplementary Examinations Jan/Feb 2014

Signals and Systems
(ECE)

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

****

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

1. a) Derive the expression for mean square error when functions is approximated in set of mutually orthogonal functions 8M
   b) Explain how signum function is expressed in terms of unit step function. 6M
2. a) Discuss the concept of trigonometric Fourier series and derive the expressions for coefficients. 7M
   b) Explain how exponential Fourier series can be extended for periodic functions. 7M
3. a) State and prove time convolution and time differentiation properties of Fourier transform 7M
   b) Find the Fourier transform of a gate pulse of unit height, unit width and centered at t = 0 7M
4. a) Explain the characteristics of an ideal LPF. Explain why it can't be realized 8M
   b) Differentiate between causal and non-causal systems 6M
5. a) State and prove frequency Convolution property of Fourier transform 6M
   b) Find the correlation of symmetrical gate pulse with amplitude and time duration `1' with itself. 8M
6. a) State and prove sampling theorem for band limited signals using analytical approach 8M
   b) Give introduction to band pass sampling. 6M
7. a) Determine the Laplace transform and the associate region convergence for each of the following functions: (i) $x(t) = 1; 0 \leq t \leq 1$ (ii) $x(t) = t$ for $0 \leq t \leq 1$ and $x(t)=2-t$ for $1 \leq t \leq 2$. 8M
   b) State and prove initial value theorem of Laplace transform 6M
8. a) Explain the properties of the region of convergence of X (z). 6M
   b) Discuss in detail about the double sided and single sided Z- transform. Correlate Laplace transform and Z-transform in their end use. 8M

****

Code : 1G245

R-11

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

II B.Tech. II Semester Supplementary Examinations Jan/Feb 2014

Switching Theory and Logic Design
(ECE)

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

****

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

1. a) Convert the following numbers with the indicated bases to decimal: $(12121)_3$; $(4310)_5$; $(50)_7$; and $(198)_{12}$ 8M
   b) Given that $(16)_{10}=(100)_a$ and $(292)_{10}=(1204)_b$, determine the value of a and b. 6 M
2. a) Simplify the following Boolean expressions to a minimum number of literals
   (i) AB+(AC)'+AB'C(AB+C) (ii) A'B+A'BC'+A'BCD+A'BC'D'E 7 M
   b) Implement the following function using only NOR gates F = a(b+cd)+bc' 7 M
3. Simplify the following Boolean function by means of the Tabulation method.
   f(v,w,x,y,z) = Σ(0,1,3,8,9,13,14,15,16,17,19,24,25,27,31) 14M
4. a) Design a combinational circuit with four inputs and four outputs. The output generates the 2's complement of the input binary number. 7 M
   b) Design a BCD to gray code converter. 7 M
5. Implement the following functions using PAL and PLA
   F1=Σm(2,3,4,7,8,11), F2= Σm(1,3,5,7,9,11,13,15) 14M
6. A synchronous sequential machine has a single control input x and the clock, and two outputs A and B. On consecutive rising edges of the clock, the code on A and B changes from 00 to 01 to 10 to 11 and repeats itself if x=1; if at any time, x=0, it holds to the present state. Draw the state diagram and implement the circuit using T flip-flops. 14M
7. a) What is a merger graph? 4 M
   b) For the state tables of the incompletely specified sequential machines given below, find the set of maximal compatibles using (i) the merger graph method and (ii) the merger table method

PS	NS,Z			
	I_0	I_1	I_2	I_3
A	C,0	_	C,0	_
B	A,_	B,1	C,_	_
C	_	C,0	_,1	D,0
D	F,0	_	E,1	C,_
E	F,0	_	A,_	C,1
F	_	B,1	_,0	B,1

10M

8. a) Differentiate between an ASM chart and a conventional flow chart. 4 M
   b) Draw the state diagram, state table, and ASM chart for a sequence detector to detect the sequences 1111 and 0000. It has to output a 1 when the sequence is detected. Overlapping is not permitted. 10M

***

Code : *1G246*

R-11

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

II B.Tech. II Semester Supplementary Examinations Jan/Feb 2014

Electrical Technology
(ECE)

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

****

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=50 ohms, L=1mH, C=10 μF. The circuit is exited by 100 V source. Find $i(0)^+$, $di/dt\ (0^+)$ and $d^2i/dt^2\ (0^+)$ 14M

2. a) State and explain Hybrid parameters. 7M

   b) A two port network has the Y-parameters: Y_{11}=10, Y_{12}= -5, Y_{21}= -20 and Y_{22}=2, all in milli mhos. Find the new Y parameter if a 100 ohms resistor is connected (i) across the input (ii) across the output. 7M

3. a) Write short notes on Band pass filter. 7M

   b) Design constant k-high pass filter with a cut off frequency of 1 kHz and a nominal impedance of 500 ohms. 7M

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

   b) Design a T-pad attenuator to give an attenuation of 60 dB and to work in a line of 800ohms. 7M

5. a) How the DC generators are classified? Explain in detail. 8M

   b) A 4 – pole wave connected DC generator having 60 slots on its armature with 6 conductors per slot, runs at 750 rpm and generates an open circuit voltage of 230 V. Find the useful flux per pole. 6M

6. a) Explain aim and procedure of Swinburne's test with neat circuit diagram. 7M

   b) A 200V DC shunt motor takes a total current of 100 A and runs at 750 rpm. The resistance of the armature winding and shunt field winding is 0.1 ohms and 40 ohms respectively. Find the torque developed by the armature. 7M

7. a) Derive the equivalent circuit parameters of Single phase Transformers. 7M

   b) A 100 kVA, 1000/10000 V, 50 Hz, Single phase transformer has an iron loss of 1100 W. The copper loss with 5 A in the high voltage winding is 400 W. Calculate the efficiency at 25 %, 0.8 Power factor. The out put terminal voltage being maintained at 10000 V. 7M

8. Explain the principle of operation and characteristics of

   (a) Capacitor motors (b) Synchros 14M

***

Code : 1G342

R-11

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

II B.Tech. II Semester Supplementary Examinations Jan/Feb 2014

Electromagnetic Waves and Transmission Lines
(ECE)

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

****

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

1. a) Define Electric field intensity? Derive Electric field intensity for surface charge. 8M

   b) A spherical volume of r=1 m has a uniform charge density $\rho = 1$ C/m^2. What is the Potential at r = 0.5 m. 6M

2. a) Explain continuity of current equation and derive equation for rearrangement time? 7M

   b) A cylindrical capacitor has radii a = 1 cm, b = 2.5 cm. If the space between the plates is filled with inhomogeneous dielectric with 7M

   $$\varepsilon_r = (10 + \rho) / \rho$$

   Find Capacitance /meter of the capacitor.

3. a) State Ampere's circuit law? Derive magnetic field intensity H for infinite sheet of current by applying Ampere's law? 7M

   b) Determine Magnetic induction at the center of a triangle whose length of each side is 'a' mt. 7M

4. a) How Maxwell rectifies the inconsistency of Ampere law. 6M

   b) Show that the time varying field 8M

   $E = 30 \sin(2x) \sin(kz - \omega t)\, a_y$ V/m

   where $k^2 = \mu_0\varepsilon_0\omega^2 - 4$, is a genuine EM field – that is it satisfies Maxwell's equation in free space. Find the corresponding H and J_d.

5. a) Derive equation for uniform plane wave in good conductors. 7M

   b) In a lossless dielectric for which $\eta = 60\ \pi$, $\mu_r = 1$, 7M

   $H = -0.1 \cos(\omega t - z)\, a_x + 0.5 \sin(\omega t - z)\, a_y$. A/m.

   Calculate ε_r, ω and E.

6. a) Derive expression for reflection coefficient Γ when a plane wave is incident oblique for perpendicular polarization. 7M

   b) In free space ($z \leq 0$), a plane wave with 7M

   $H_i = 10 \cos(10^8 t - \beta z)\, a_x$ mA/m

   Is incident normally on a lossless medium ($\varepsilon = 2\varepsilon_0$, $\mu = 8\mu_0$) in region $z \geq 0$. Determine the reflected wave H_r, E_r, and the transmitted wave H_t, E_t.

7. a) Prove that "Infinite line is equivalent to a finite line terminated in its Z_0." 7M

   b) A generator of 1V, 1000Hz, supplies power to 1000 km long open wire line terminated in Z_0. And having R = 10.4 ohm, G = 0.8 micromhos, c = 0.00835 microfarads. Calculate Phase velocity, Characteristic impedance, Propagation constant, power delivered at the receiving end. 7M

8. a) Find input impedance of open and short circuit lines. Prove that input impedance of an infinite line is its characteristic impedance. 7M

   b) Define reflection coefficient K. Derive equation for K in terms of characteristic impedance Z_0 and terminating impedance Z_r. 7M

***

Code : 1G244

R-11

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

II B.Tech. II Semester Supplementary Examinations Jan/Feb 2014

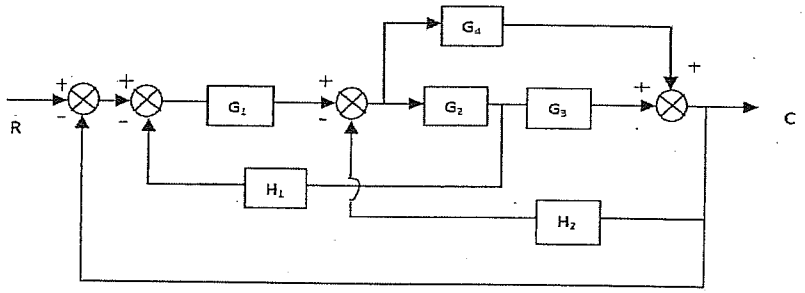
Linear Control Systems
(Common to EEE & ECE)

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

****

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

1. a. List the characteristics of closed loop control system and explain the closed loop control system with an example. 8M
   b. Explain the effect of feedback on transient response of a system. 6M
2. a. Explain the working principle of an AC servomotor with necessary diagrams. 7M
   b. Simplify the block diagram shown in figure below. 7M



3. Derive the time response of a second order system when subjected to a unit step input signal for all possible values of damping ratio. 14M
4. The characteristic equation of a feedback control system is given by $s^4+3s^3+12s^2+(k-16)s+k=0$. Sketch the root locus plot for $0 \leq k < \infty$ and show that the system is conditionally stable. Determine the range of gain for which the system is stable 14M
5. Plot the Bode plot for $G(s) = \frac{k}{s(s+2)(s+20)}$. Determine 14M
   (i) Limiting value of k for system to be stable.
   (ii) Value of k for gain margin to be 10 db.
   (iii) Value of k for phase margin to be 50°.
6. a. Explain the concept of Nyquist stability criterion. 8M
   b. The open loop transfer function of a unity feedback system is given by $G(s) = \frac{1}{s(1+s)(1+2s)}$. Sketch the polar plot. 6M
7. a. Explain the steps involved in the design of Lead compensator in frequency domain. 7M
   b. Design a Lead compensator for a unity feedback system with an open loop transfer function $G(s) = \frac{k}{s(s+1)}$ for the specifications of $K_v = 10\ s^{-1}$ and $\varphi_m = 35°$. 7M
8. a. Obtain the state space representation of a field controlled DC servomotor. 7M
   b. Obtain the state model of the system whose transfer function is given by 7M
   $G(s) = \frac{s^2+3s+3}{s^3+2s^2+3s+1}$

* * *