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)

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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

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

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

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. Draw the response of high pass circuit for square wave and derive the expression for percentage tilt. 8M

   b. The periodic ramp voltage shown (Figure1a) is applied to a low pass RC circuit. Find the equations from which to determine the steady state output waveform. 6M

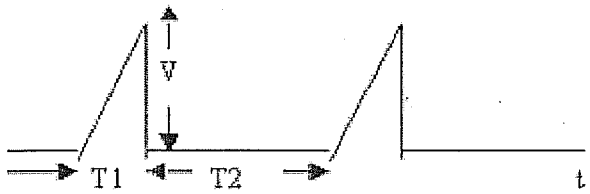

Figure 1a

2. a. Draw the circuit diagram of slicer circuit using Zener diodes and explain its operation with the help of its transfer characteristic. 7M

   b. Draw the diode comparator circuit and explain the operation of it when ramp input signal is applied. 7M

3. a. Explain the behavior of a BJT as a switch. Give Applications. 7M

   b. A germanium transistor is operated at room temperature in the CE configuration. The supply voltage is 6V, the collector-circuit resistance is 200Ω and the base current is 20% higher than the minimum value required to drive the transistor into saturation. Assume the following transistor parameters: 7M

   Ico= -5μA, I_{EO}=-2μA, h_{FE}=100, and $r_{bb'}$=250Ω. Find V_{BE}(Sat) and V_{CE}(Sat).

4. a. Explain how a Schmitt trigger can be used as a comparator and as a squaring circuit. 8M

   b. A collector coupled mono stable multi vibrator using n-p-n silicon transistor has the following parameters V_{cc} = 12v, V_{BB}= 3v, R_C = 2kΩ, R_1 = R_2 = R = 20kΩ, h_{FE}= 30, r_{bb}= 200 Ω and C = 1000pF. Calculate and plot to scale the wave slopes at each base and collector. Also find width of the o/p pulse. 6M

5. a. With the help of a neat circuit diagram and waveforms explain the working of a transistor Miller time base generator. 8M

   b. In the UJT sweep circuit, V_{BB} = 20V, V_{yy} = 50V, R=5kΩ, C=0.01 μF. 6M

   UJT has η= 0.5. Calculate

   i. amplitude of sweep signal

   ii. Slope and displacement errors and

   iii. estimated recovery time.

6. a. What is pedestal? How it effects the output of a sampling gates? How to avoid it? 7M

   b. For the four diode sampling gate $R_L=R_C=100k\Omega$ and that $R_2=2k\Omega$, $R_f=50\Omega$ for $V_s=25V$, compute gain A ,V_{min} and $V_{c(min)}$,,compute $V_{n(min)}$ for $V=V_{min}$. 7M

7. a. Explain about synchronization of a sweep circuits with symmetrical signals. 8M

   b. A UJT sweep operates with $V\nu$ =3V,Vp =16V and $\eta = 0.5$. A sinusoidal synchronizing voltage of 2V peak is applied between bases and natural frequency of the sweep is 1 KHz, over what range of sync signal frequency will sweep remain in 1:1 synchronism with the sync signal? 6M

8. a. Explain the effect of diode capacitance on the out put of pulse of a diode AND gate. 6M

   b. Draw the circuit diagram of NAND gate using TTL logic and explain. 8M

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

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

Electrical Circuits-II
(EEE)

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

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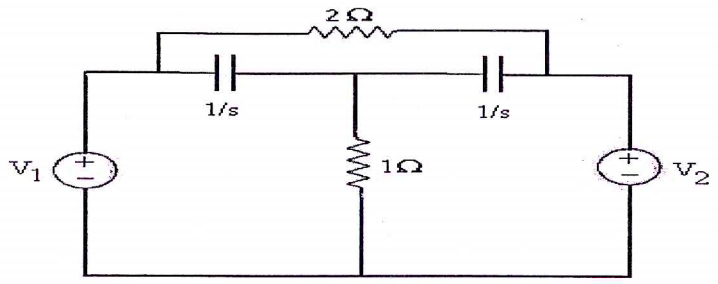
Answer *any five* full questions
All Questions carry equal marks (14 Marks each)

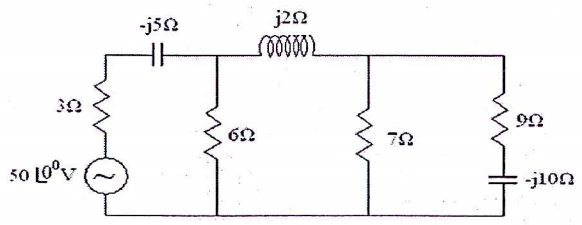
1. a. Obtain the expression of ABCD parameters in terms of Z parameters 7

   b. Find the Y- parameters for the bridged T network as shown in fig below. 7



2. a. Write the properties of tree with example 7

   b. Determine power supplied by source using nodal analysis for the circuit shown. 7



3. a. Derive the Fourier series of a square wave drawing a neat wave form. 7

   b. A series RLC circuit with R=25Ω, L=1H and C=10μF is energized with a source V(t) =15sin100t + 20sin200t + 5sin300t. Determine the effective value of current and the average power consumed by the circuit. 7

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

   b. A Function in S-domains is given by $G(s) = \frac{S+1}{S(S+2)}$. Find the initial value of $g(t)$. 7

5. a. Derive the expression for i(t) of R-L series circuit when DC voltage in applied to it at t=0 by closing the switch. Define time constant of R-L circuit. 7

   b. A dc voltage of 200V is suddenly applied to a series L-R circuit having R = 20Ω and inductance 0.2H. Determine the voltage drop across the inductor at the instant of switching on and at 0.02 sec later. 7

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

   b. A 50Hz, 400V (peak value) sinusoidal voltage is applied at A=0 to a series R-L circuit having resistance 5 ohms and inductance 0.2H. Obtain an expression of current at any instant 't', calculate the value of the transient current 0.01sec after switching on. **7**

7. a. Explain concept of poles and zero's in a Network Function **7**

   b. Obtain the Driving Point admittance of a combination of a capacitor which is parallel to the R-L Series circuit. **7**

8. a. write the passive real functions **7**

   b. Realize the network whose impedance is given as $Z1(s) = \frac{s^4+10s^2+7}{s^3+2s}$. **7**

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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

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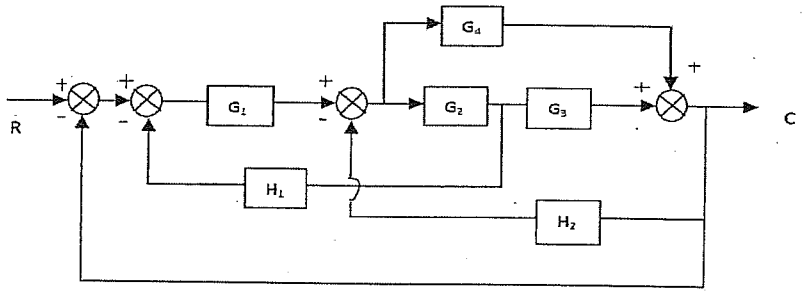
Answer *any five* questions
All Questions carry equal marks (14 Marks each)

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 $0 \le k < \infty$ 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
   $$G(s) = \frac{s^2+3s+3}{s^3+2s^2+3s+1}$$

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