Hall Ticket Number : | | | | | | | | | | |

Code : 1G341

R-11/R-13

II B.Tech. II Semester Supplementary Examinations December 2015

Signals and Systems

(Electronics & Communication Engineering)

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

Answer *any five* questions

All Questions carry equal marks (14 Marks each)

****

1. a) Prove that the complex exponential signals are orthogonal functions. 6M

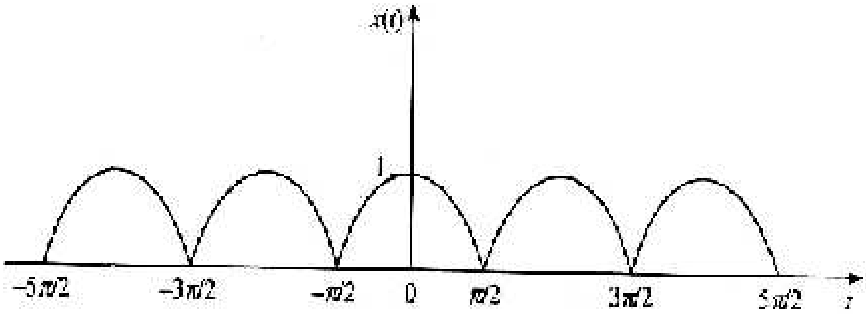
   b) i) State and prove the properties of impulse function. 3M

   ii) Give the relations between impulse, unit step and ramp function. 5M

2. a) i) Determine the trigonometric Fourier series expansion of a full wave rectified cosine function shown below. 5M

   ii) Derive the corresponding exponential Fourier series. 5M

   iii) Draw the complex Fourier spectrum. 4M



3 a) i) Find the Fourier transformer the RF pulse given below using Fourier transform properties.

$$y(t) = A\,\mathrm{rect}\left(\frac{t}{2}\right)\cos(2® f_c t)$$ 4M

   ii) State and prove the time differentiation Fourier transform property 3M

   b) Find the inverse Fourier transform of

   i) sgn(ω) 4M

   ii) u(ω) 3M

4. a) Show that ideal low pass filter is physically unrealizable 7M

   b) The impulse response of a continuous time system is expressed as

   $h(t)=(1/RC)\exp^{(-t/RC)}u(t)$.

   Find the frequency response and plot the magnitude and phase plots. 7M

5. a) Find the autocorrelation and power spectral density of the signal

   $x(t)=A\sin(\omega_0 t+\Theta)$ 7M

   b) State and prove parsvel's theorem and Verify Parsvel's theorem for the signal $x(t)=e^{-4t}u(t)$. 7M

6 a) State in prove sampling theorem for band limited signals. 7M

b) Explain the following:

i) Flat-top sampling 3M

ii) Natural sampling. 2M

iii) Aliasing effect. 2M

7. a) Find the inverse Laplace transform of ((1-s)/(s+1)(s^2+4s+13))) 5M

b) i) Define ROC. List the properties of ROC of Laplace transform. 5M

ii) State and prove the final value theorem of Laplace transform. 4M

8. a) Find the inverse Z-transform of $X(z) = \frac{1}{1-1.5z^{-1}+0.5z^{-2}}, |z|>1$ using the contour Integration method. 7M

b) Prove that the sequences x(n)= -a^n u(-n-1) and x(n)= a^n u(n) have the same X(z) and differ only in ROC. Also plot their ROCs. 7M

***

Hall Ticket Number :										

R-11/R-13

Code : 1G342

II B.Tech. II Semester Supplementary Examinations December 2015

Electromagnetic Waves and Transmission Lines

(Electronics & Communication Engineering)

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

Answer *any five* questions

All Questions carry equal marks (14 Marks each)

****

1. a) State and explain coulomb's law? Obtain an expression in vector form. 7M

   b A charge Q_2=121X10^{-9}C is located in vacuum at P_2 (-0.03, 0.01, -0.04) find the force on Q_2 due to Q_1=100μC at P_1(0.03, 0.08, 0.02). All distances are in meters. 7M

2. a) Explain the equation of continuity for time varying fields. 7M

   b) Define & Differentiate Convection and Conduction currents? 7M

3. a) Determine the magnetic field intensity due to infinite long co-axial transmission line. 10M

   b) State the Ampere's circuit law. 4M

4. a) Derive the Maxwell's two equations for magneto static fields in point and integral forms. Give their word statements and explain their significance. 6M

   b) Derive an expression for magnetic field strength H due to a finite filamentary conductor carrying a current I and placed along Z-axis at a point P on Y-axis. Hence deduce the magnetic field strength for the length of the conductor extending from $-\infty$ to $+\infty$. 8M

5. a) Determine the intrinsic impedance in free space for a uniform plane wave. 7M

   b) Determine propagation constant, phase velocity and intrinsic impedance of uniform plane wave in a good conductor and dielectric materials. 7M

6. a) Explain briefly about Poynting theorem with applications. 6

   b) Derive an expression for reflection coefficient Γ when a plane wave incident normally on an interface between two different media. 8

7. a) Prove that a line of finite length and terminated by its characteristic impedance Z_0 is equivalent to a line of infinite length. 7M

   b) A lossless transmission line of length 100 m has an inductance of 28 μH and capacitance of 20 nF. Find out

      i. Propagation velocity
      ii. Phase constant at an operating frequency of 100 KHz
      iii. Characteristic impedance of the line. 7M

8 a) Derive the expression for the input impedance of a transmission line of length L. 7M

   b) A loss less line of 300 Ω is terminated by a load of Z_R. If the VSWR at 200 MHz is 4.48, and the first V_{min} is located at 6 cm from the load. Calculate the reflection coefficient and Z_R. 7M

***

Hall Ticket Number :										

R-11/R-13

Code : 1G246

II B.Tech. II Semester Supplementary Examinations December 2015

Electrical Technology

(Electronics & Communication Engineering)

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

Answer *any five* questions

All Questions carry equal marks (14 Marks each)

****

1. a) The switch in the Fig.1 has been in position '*a*' for a long time, until t = 4 s when it is moved to position *b* and left there. Determine $v(t)$ at t = 10 s.

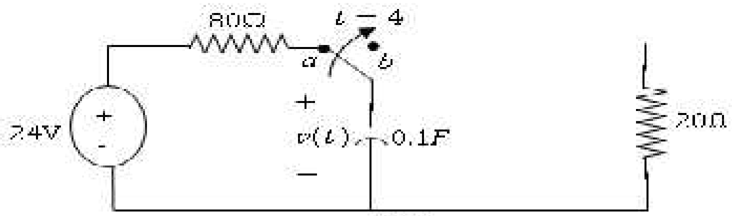


Fig.1 7M

b) The switch in Fig.2 was open for a long time but closed at t = 0. Determine: (*i*) $i(0+)$, $v(0+)$ and (*ii*) $i(\infty)$, $v(\infty)$.

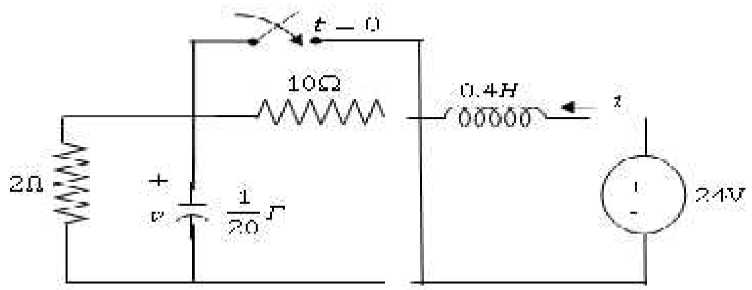


Fig. 2 7M

2. a) The Z-parameters for a two-port network are: Z_{11} = 25Ω, Z_{22} = 40Ω, Z_{12} = Z_{21} = 20Ω. Calculate the h- and ABCD-parameters of the network. Also find its equivalent T-network. 7M

b) Find the transmission parameters of the network shown in Fig.3.

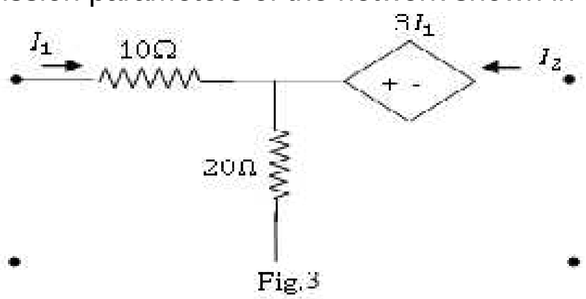


Fig.3 7M

3. a) What is a constant K-filter? Show that propagation constant ' β ' of a 'T' type low pass section having a total series arm inductance 'L' and shunt arm capacitance 'C' is given by

$\beta = \cos h^{-1}\left(1-\frac{w^2LC}{2}\right)$. Examine the nature of attenuation and phase variation in and outside the pass band of the filter. 7M

b) Each of the two series elements of a T-type low pass filter consists of an inductance of 60mH having negligible resistance and shunt element having a capacitance of 0.2 μF. Calculate the cut off frequency and determine the iterative impedances at frequencies of (i) 1 KHz and (ii) 5 KHz. Also find the ratio of, and the phase difference between the input and output voltages for one section of the filter at 1 KHz and 3 KHz. 7M

4. a) Obtain the necessary expressions to show that characteristic impedance, and the series and shunt arm impedances of a symmetrical ‘T’ – network may be determined from the values of the input impedances of the network measured under open and short-circuit conditions. 7M

   b) Design an unbalanced π-attenuator with a loss of 20dB to operate between 200 Ω line and 500 Ω line. 7M

5. a) Explain the classification of dc generator based on their field excitation. 7M

   b) A short shunt compound generators supplies 200A at 100V. The resistance of armature, series field and shunt field is 0.04, 0.03 and 60 respectively. Find the emf generated. 7M

6. a) Derive an expression for the torque of a dc motor. 7M

   b) Calculate the torque developed in the armature of a 440 volts dc shunt motor having an armature resistance of 0.25 ohms and running at 750 rpm when taking an armature current of 60 amps. 7M

7. Explain the tests to be conducted on a transformer and how the equivalent circuit parameters are obtained from the tests. Also how the regulation and efficiency are predetermined from the data obtained? 14M

8. Write short notes on the following:

   a) Capacitor-start single Phase Induction motor. 7M

   b) AC servomotor. 7M

***

Hall Ticket Number :

R-11/R-13

Code : 1G244

II B.Tech. II Semester Supplementary Examinations December 2015

Linear Control Systems

(Common to EEE & ECE)

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

Answer *any five* questions

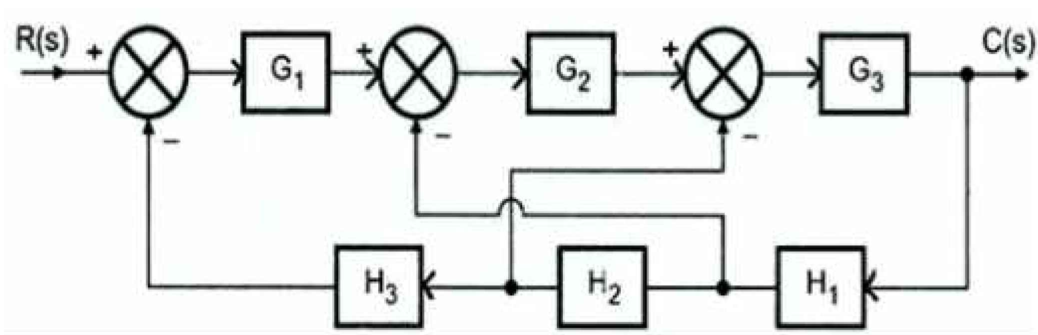
All Questions carry equal marks (14 Marks each)

****

1. a) Explain the following terms:
   (i) Linear systems and nonlinear systems
   (ii) Continuous systems and discrete systems

   b) What is the sensitivity function and explain it with respect to open loop and closed loop systems?

2. a) Reduce the block diagram given in figure and hence obtain the transfer function C(s)/R(s)



   b) Derive the Transfer Function for armature controlled d.c. motor, with neat diagram and explain the advantages of armature controlled d.c. motor over field controlled d.c. motor.

3. a) Define type and order of a control system? Explain each with an example?

   b) A unity feed-back system has G(s) = 80/s(s+6) and r(t)= 4t. Determine
      i. the steady state error
      ii. the value of K, to reduce the error by 6% .

4. Sketch the root locus plot for the system having G(s) = K/(s+1); H(s) = (s+1)/(s2+4s+5)

5. a) State the effect of `transportation lag' term on Bode plots.

   b) The open loop transfer function of a unity feed back system is

   $$G(s)=\frac{Ke^{0.1s}}{s(1+s)(1+0.1s)}$$ Draw the Bode plots.

6. a) Explain how the type of a system determines the shape of polar plot.

   b) Write a note on Nyquist criterion for minimum phase & non minimum phase transfer functions

7. a) What is compensation? What are the different types of compensators? What is a lag compensator, obtain the transfer function of lag compensator and draw pole-zero plot?

   b) What is a lag compensator, obtain the transfer function of lag compensator and draw pole-zero plot?

8. a) For the given T.F T (s) = b0/S3+a2S2+a1S+a0. Obtain the state model (phase variable form)?

   b) Obtain the state model for field controlled DC Motor

***

Hall Ticket Number :										

Code : 1GC41 **R-11/R-13**

II B.Tech. II Semester Supplementary Examinations December 2015

Mathematics-III

(Common to EEE & ECE)

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

Answer *any five* questions

All Questions carry equal marks (14 Marks each)

****

1. a) Show that $(m,n)=\dfrac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$. 7M

   b) Evaluate the integral in terms of gamma function $\int_0^{\pi/2}\sqrt{\tan\theta}\,d\theta$. 7M

2. a) If $w=\phi+i\psi$ represents the complex potential function for an electric field and $\psi=x^2-y^2+\dfrac{x}{x^2+y^2}$ determine the function ϕ . 7M

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

3. a) Find all the roots of the equation $\sinh z=i$. 7M

   b) Separate the real and imaginary parts of $\tanh z$. 7M

4. a) Evaluate $\int_C \dfrac{e^{2z}}{(z-1)(z-2)}dz$, where C is the circle |z|=3. 7M

   b) Evaluate $\int_C \dfrac{\sin^2 z}{\left(z-\pi/6\right)^3}dz$, where C is the circle |z|=1. 7M

5. a) Find Taylor's series expansion of $f(z)=\dfrac{1}{(z+1)^2}$ about the point z = -i. 7M

   b) Expand $f(z)=\dfrac{1}{(z-1)(z-2)}$ in the region 0<|z-1|<1. 7M

6. a) Evaluate $\int_c \dfrac{z-3}{z^2+2z+5}dz$ where C is the circle i) |z|=1 ii) |z+1-i|=2. 7M

   b) Show that $\int_0^{2\pi}\dfrac{\cos 2\theta}{1-2a\cos\theta+a^2}d\theta=\dfrac{2\pi a^2}{1-a^2},\left(a^2<1\right)$ 7M

7. a) If the real number $a>e$, prove, by using Rouche's theorem, that the equation $e^z=az^n$ has n roots inside the unit circle. 7M

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

8. a) Find the Bilinear transformation which maps the points $z=1,i,-1$ onto the points $w=i,0,-i$. Hence Find the image of |z|<1. 7M

   b) Show that the transformation $w=\cosh z$ maps the lines parallel to the y-axis in the z-plane into the family of ellipses in the w-plane. 7M

***

Hall Ticket Number :										

R-11/R-13

Code : 1G245

II B.Tech. II Semester Supplementary Examinations December 2015

Switching Theory and Logic Design

(Electronics & Communication Engineering)

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

Answer *any five* questions

All Questions carry equal marks (14 Marks each)

****

1. a) Convert the following to Decimal and then to Hexadecimal.
   (i) $(744)_8$
   (ii) $(1552)_8$
   (iii) $(11011001)_2$
   (iv) $(11110011)_2$
   (v) $(557)_{10}$
   (vi) $(739)_{10}$ 7M

   b) Convert the following numbers:
   (i). $(4567)_8$ to base 10
   (ii). $(53.1575)_{10}$ to base 2.
   (iii) Represent +25 and -25 in sign-magnitude, sign-1's Complement and representation.
   (iv) Why the computer works for binary number system only? 7M

2. a) Convert the following expressions in to sum of products and product of sums
   (i). $(AB+C)(B+C^{'}D)$
   (ii). $X^{'}+X(X+Y^{'})(Y+Z^{'})$ 7M

   b) Obtain the Dual of the following Boolean expressions.
   (i). $(AB^{'}+AC^{'})(BC+BC^{'})(ABC)$
   (ii). $(AB^{'}C+A^{'}BC)ABC$
   (iii). $(ABC)^{'}(A+B+C)^{'}$
   (iv). $A+B^{'}C(A+B+C^{'})$ 7M

3. a) Express BC+BD + AC+AD in its minimum sum of products and minimum product of sums. 7M

   b) Let $f=\sum(5, 6, 13)$ and $f_1=\sum(0, 1, 2, 3, 5, 6, 8, 9, 10, 11, 13)$. Find f2 such that f = f1.f2 and realize the minimal sop expression for f2 . 7M

4. a) Implement the following funtion using a multiplexer of proper size
   $F(w,x,y,z)=\sum m(0,1,2,3,4,9,13,14,15)$. 7M

   b) Design a circuit to convert Excess-3 code to BCD code Using a 4-bit Full adder. 7M

5. a) Implement the following functions using PLA
$x_1(P,Q,R)=\sum(0,1,2,7)$, $x_2(P,Q,R)=\sum(1,4,5,6)$ 7M

b) How does the architecture of PLA differ from ROM and PAL? 7M

6. a) Design Mod-6 synchronous counter using J-K flip-flop. 7M

b) Explain the steps involved in the design of synchronous sequential circuits. 7M

7. a) Compare Mealy and Moore models with block diagram. 4M

b) Determine the minimal state equivalent of the state table given below.

PS	NS,Z	
	x=0	x=1
q_0	$q_0, 1$	$q_4, 0$
q_1	$q_0, 0$	$q_4, 0$
q_2	$q_1, 0$	$q_5, 0$
q_3	$q_1, 0$	$q_5, 0$
q_4	$q_2, 0$	$q_6, 1$
q_5	$q_2, 0$	$q_6, 1$
q_6	$q_3, 0$	$q_7, 1$
q_7	$q_3, 0$	$q_7, 1$

10M

8. a) Show the exit paths in an ASM Block for all binary combinations of control variables x, y and z, starting from an initial state. 6M

b) Draw the ASM chart for the following state transition, start from initial state *T*1, then if xy=00, go to *T*2, if xy=01 go to *T*3, if xy=10 go to *T*1, otherwise go to *T*3. 8M

***