Code : 1G342 **R-13**

II B.Tech. II Semester Regular Examinations May 2015

Electromagnetic Waves and Transmission Lines

(Electronics & Communicaiton Engineering)

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

Answer *any five* questions

All Questions carry equal marks (14 Marks each)

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1. a) Obtain the expressions for the far field and the potential due to a small electric dipole oriented along z-axis. 7M

   b) A circular disk of radius 'a' is uniformly charged with ρ_s C/m^2 and is in z=0 plane. Find the Electric Field at the point (o,0,h) along its axis. 7M

2. a) In a cylindrical conductor of radius 2mm, the current density varies with distance from the axis according to J = $10^3 e^{-400r}$A/m^2. Find the total current I. 7M

   b) Establish Poisson's and Laplace's equations from Gauss's law. 7M

3. a) With the help of Ampere's work law find the magnetic field in a closely wound toroidal coil? 7M

   b) Determine the field strength 'H' at a point on the axis of an infinite solenoid of radius 'R' and 'n' turns/meter. 7M

4. a) Write the Maxwell's equations for time varying fields in i) Point form, ii) integral form, and iii) differential form. Give word statement of each equation. 7M

   b) A parallel plate capacitor with plate area of 5 cm^2 and plate separation of 3 mm has voltage 50 sin 1000t V applied to its plates. Calculate the displacement current assuming $\varepsilon = 2\,\varepsilon_0$ 7M

5. a) For good dielectrics derive the expressions for attenuation constant, Phase constant, Phase velocity and Intrinsic impedance. 8M

   b) Explain the terms Linear polarization, Elliptical polarization and Circular polarization. 6M

6. a) State and prove Poynting Theorem. 6M

   b) A plane wave travelling in a free space has an average poynting vector of 5 watts/m^2. Find the average energy density. 8M

7. a) Derive the relationship between primary constants and secondary constants of a transmission line. 7M

   b) A telephone line, 10 Km long has the following constants; $Z_0 = 300\angle 0^0\,\Omega$, β=0.1 wiper/Km and α = 0.05 radians Km. 7M

8. a) Using Smith chart, calculate the position and length of a short circuited stub designed to match a 200 ohm load to a transmission line whose characteristic impedance is 300 ohms. Also calculate the SWR on the main line when the frequency is increased by ten percent, assuming that the load and line impedances remain constants. 9M

   b) Describe the characteristics and importance of quarter and half-wave transmission lines in detail. 5M

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Code : 1G244 **R-13**

II B.Tech. II Semester Regular Examinations May 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)

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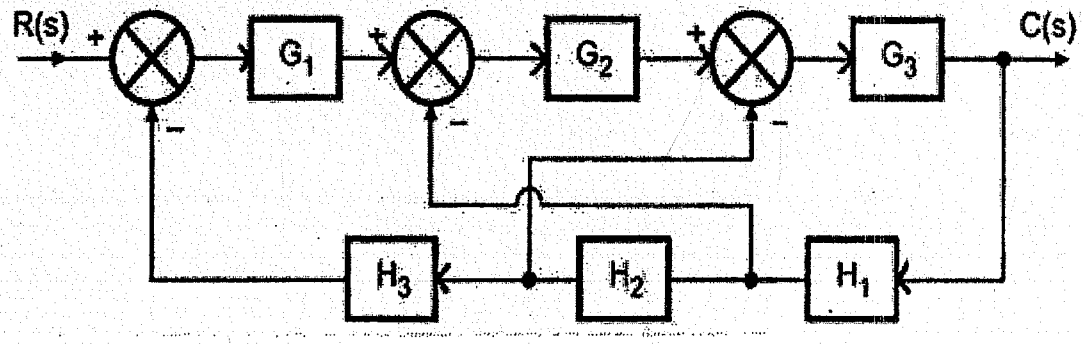
1. a) Explain the difference between systems with feedback and without feedback.
   b) Find the transfer function C(s) R(s) of a system having differential equation. $9d^2c(t)/dt^2 + 12dc(t)/dt + c(t) = r(t) + 2r(t-1)$.
2. a) Explain the working principle of synchro receiver with neat sketch.
   b) Reduce the given block diagram and hence obtain the transfer function C(s)/R(s)



3. a) Write the specifications of a second order system
   b) Sketch the impulse response of a second order system when damping factor is
      i) 0 **ii)** Between 0 and 1 **iii)** Greater than 1
4. a) Construct Routh array and determine the stability of the system whose characteristic equation is S6 + 2S5 + 8S4 + 12S3 + 20S2 16S16 = 0. Also determine the no. of roots lying on right half of s-plane, left half of s-plane and on imaginary axis?
   b) Check whether the points (-1+ j) and (-3+ j) lie on the root locus of a system given by G(s)H(s) = K/(s+1)(s+2) . Use the angle condition.
5. Write short notes:
   (a) Frequency domain specifications
   (b) Stability analysis from Bode plots.
6. With the help of Nyquist plot assess the stability of a system
   G(s) = 3/s(s+1)(s+2)
   What happens to stability if the numerator of the function is changed from 3 to 30?
7. a) Distinguish between lag compensator and lead-lag Compensator.
   b) Explain various steps involved in design of lag compensator using Bode plot
8. a) Construct the state model for a system characterized by the differential equation. $\ddot{y} + 5\dot{y} + 6y = u$.
   b) Obtain the state model for armature controlled DC Motor.

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Code : 1GC41 **R-13**

II B.Tech II Semester Regular Examinations May 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)

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

   b) Prove that $\int_0^1 \frac{x^2dx}{\sqrt{1-x^4}} \times \int_0^1 \frac{dx}{\sqrt{1+x^4}} = \frac{\pi}{4\sqrt{2}}$ 7M

2. a) If $u(x,y)$ and $v(x,y)$ are harmonic functions in a region R, show that the function $(\frac{\partial u}{\partial y}-\frac{\partial v}{\partial x})+i(\frac{\partial u}{\partial x}+\frac{\partial v}{\partial y})$ is an analytic function. 7M

   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. 7M

3. a) Separate the real and imaginary parts of log sin z. 7M

   b) Find all the roots of the equation $\tanh z+2=0$. 7M

4. a) Evaluate $\int_{1-i}^{2+i}(2x+1+iy)dz$ along the straight line joining $(1-i)$ to $(2+i)$. 7M

   b) Evaluate $\int_C \frac{z^3e^{-z}}{(z-1)^3}dz$ where C is | z – 1 | = ½ using Cauchy's integral formula. 7M

5 a) Expand $f(z)=\frac{z-1}{z+1}$ in Taylor series about the points (i) z = 0 and (ii) z=1 7M

   b) Expand $\frac{1}{(z^2+1)(z^2+2)}$ in positive and negative powers of z if $1<|z|<\sqrt{2}$ 7M

6. a) Evaluate $\int_C \frac{e^z}{\cos \pi z}dz$ where C is the unit circle $|z|=1$ 7M

   b) Using complex variable technique show that $\int_0^{\pi} \frac{d\theta}{3+2\cos\theta}=\frac{\pi}{\sqrt{5}}$ 7M

7. a) Applying Rouche's theorem, 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 $\frac{3}{2}<|z|<2$. 7M

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

8. a) Show that the function $w=\frac{4}{z}$ transforms the straight line $x=c$ in the z– plane onto a circle in the w – plane. 7M

   b) Determine the Bilinear transformation which maps $z=0,-i,2i$ into $w=5i,\infty,-i/3$. 7M

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Code : 1G341 | R-13

II B.Tech. II Semester Regular Examinations May 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)

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1. a) Obtain the condition under which two signals $f_1(t)$ and $f_2(t)$ are said to be orthogonal to each other. Hence, prove that $\sin(n\omega_0 t)$ and $\cos(m\omega_0 t)$ are orthogonal to each other for all integer values of m , n. 7M

   b) Derive the expression for Mean Square Error (MSE). 7M

2. With regard to Fourier series representation, justify the following statements:

   i) Odd functions have only sine terms. 5M

   ii) Even functions have no sine terms. 4M

   iii) Functions with half-wave symmetry have only odd harmonics. 5M

3. a) Find the Fourier transform of

   i) $\sin(8t+0.1\pi)$ 4M

   ii) $g(t)=(1/\pi t)$ 5M

   b) Derive the equation to determine the Fourier transform of periodic functions. 5M

4. a) i) Explain causality and physical realizability of a system and hence give Paley-Wiener criterion. 5M

   ii) Using Paley –wiener criterion, prove that $|H(\omega)| = e^{-\omega^2}$ is not a suitable magnitude response for a casual LTI system 5M

   b) Obtain the conditions for distortion less transmission through a system. 4M

5 a) Determine the PSD of a periodic function f(t) with period T. Derive the expression for PSD of periodic signals. 7M

   b) Find the convolution of a rectangle signal x(t) with itself using graphical method.

   Given

   x(t)=A for –T<t<T

   =0 otherwise 7M

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

   b) i) Compare various sampling techniques. 5M

   ii) What is aliasing effect? How can we avoid it? 2M

7. a) Prove that the Laplace transform of even and odd functions is even and odd function respectively. 7M

   b) i) State and prove initial value theorem of Laplace transform. 4M

   ii) Derive the relation between Fourier transform and Laplace transform. 3M

8. a) Find the inverse Z-transform of $X(z) = \dfrac{1}{1-1.5z^{-1}+0.5z^{-2}}, |z|>1$ 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

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Code : 1G245

R-13

II B.Tech. II Semester Regular Examinations May 2015

Switching Theory and Logic Design

(Electronics & Communicaiton Engineering)

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

Answer *any five* questions

All Questions carry equal marks (14 Marks each)

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1. a) Write the following binary numbers in signed 1's complement form and signed 2's complement form using 16 bit registers.
   i). +1001010
   ii). -11110000
   iii). -11001100.1
   iv). +100000011.111 7M
   b) Perform N1+N2, N1+(-N2) for the following 8 bit numbers expressed in a 2's complement representation. Verify your answers by using decimal addition and subtraction
   i). N1=00110010, N2=11111101
   ii). N1=10001110, N2=00001101 7M
2. a) Find the complement of the following and show that $F.F' = 0$ and $F + F' = 1$.
   i). $F = XY' + X'Y$
   ii) . $F = (X + Y' + Z)(X' + Z')(X + Y)$ 7M
   b) Obtain the Dual of the following Boolean expressions.
   i). $B'C'D + (B + C + D)' + B'C'D'E$
   ii). $AB + (AC)' + (AB + C)$
   iii). $A'B'C' + A'BC' + AB'C' + ABC'$
   iv). $AB + (AC)' + AB'C$ 7M
3. a) Differentiate prime implicant and essential prime implicant? 4M
   b) Minimize the following function using tabular minimization.
   F (A, B, C, D) = ∑m(0, 1, 2, 8, 9, 15, 17, 21, 24, 25, 27, 31) 10M
4. a) Implement the following Boolean functions using decoder and OR gates:
   F1(A,B,C,D) = ∑(1,4,7,8) , F2(A,B,C,D) = ∑ (9,10,13,15) 7M
   b) What is Hazard in switching circuits? Explain the design of Hazard free Switching circuit with an example. 7M
5. a) Derive the PLA programming table for the combinational circuit that squares a 3 bit number. 7M
   b) List out the differences between PLAs and PALs with relevant examples. 7M
6. a) Design a serial binary adder using D-Flip Flop. 7M
   b) Design a sequence generator to generate the sequence 111101 7M
7. a) Explain the capabilities and limitations of finite state machines. 4M
   b) Determine minimal state equivalent of state table given below.

PS	NS,Z	
	X=0	X=1
1	1,0	1,0
2	1,1	6,1
3	4,0	5,0
4	1,1	7,0
5	2,0	3,0
6	4,0	5,0
7	2,0	3,0

10M

8. a) Explain salient features of ASM chart. 4M
   b) Draw the state diagram and ASM chart for 2bit up-down counter having mode control input M=0 Down counting, M=1 up counting. The circuit should generate an output whenever count becomes minimum or maximum. 10M

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II B.Tech. II Semester Regular Examinations May 2015

Electrical Technology

(Electronics & Communicaiton Engineering)

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

Answer *any five* questions

All Questions carry equal marks (14 Marks each)

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1. a) An uncharged 80 μF capacitor is connected in series with a 1 kΩ resistor and is switched across a 110V supply. Determine the time constant of the circuit and the initial value of current flowing. Determine also the value of current flowing after (a) 40 ms and (b) 80 ms. 7M

   b) Refer to the circuit shown in Fig.1, the switch is closed at t = 0. (i) determine equations for i_L and v_L.(ii) At t = 300 ms, open the switch and determine equations for i_L and v_L during the decay phase. (iii) Determine voltage and current at t = 100 ms and at t =350 ms. (iv) Sketch i_L and v_L

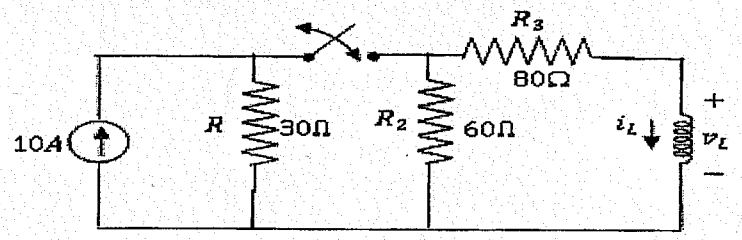

Fig. 1 7M

2. a) Derive the necessary expressions for Z parameters in terms of Y parameters. 7M

   b) Z - Parameters of a of a two-port network are $Z = \begin{bmatrix} 6 & 4 \\ 4 & 6 \end{bmatrix}\Omega$. Determine h -parameters. 7M

3. a) What are the characteristic features of m-derived filters and composite filters? Give a comparison. 7M

   b) Design an m-derived LPF, with cut off at 5 KHz, and f_∞ = 6.25 KHz, at a characteristic impedance of 600 Ω. Establish the relations used. 7M

4. a) What is attenuator? Explain π-type attenuator by deriving necessary equations. 7M

   b) A T-type attenuator has a series branch of 500 Ω and shunt branch of 110 Ω. Keeping the input impedance and attenuation unchanged, redesign the attenuator to feed an impedance of 150 Ω. 7M

5. a) Draw and explain the external characteristic of a DC shunt generator. 7M

   b) A 4 pole lap wound dc shunt generator supplies 25 KW at a terminal voltage of 500 volts. The armature resistance is 0.03 ohms and shunt field resistance is 200 ohms. The brush drop may be taken as 1 volt. Calculate the emf generated. 7M

6. a) Derive the condition of maximum efficiency of a dc machine. 7M

   b) A 230V dc shunt motor runs at 1000 rpm when the armature current is 35A. The resistance of armature circuits is 0.3 Ω. Calculate the additional resistance required in armature circuit to reduce speed of motor to 750 rpm assuming that armature current is 25A. 7M

7. Explain the principle of operation of transformer and also sketch the phasor diagrams for no load and lagging power factor load. 14M

8. Write short notes on:

   a) Stepper motor 7M

   b) Shaded Pole motor 7M

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