Hall Ticket Number :										

R-15

Code: 5G343

II B.Tech. II Semester Regular Examinations May 2017

Analog Communication

(Electronics and Communication Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. a) Define modulation. What do you mean by frequency translation? 2M

   b) The positive RF peaks of an AM voltage rise to a maximum value of 12 V and drop to a minimum value of 4 V. What is the modulation index? 3M

   c) A modulating signal given by $m(t) = 2\sin(2® \times 500t) + 3\sin(2® \times 1100t) + 5\sin(2® \times 1300t)$ amplitude modulates a carrier given by $c(t) = 10\sin(2® \times 10^6 t)$, where all amplitudes are in volts. Determine
      i. The total modulation index
      ii. The frequencies present in the modulated signal.
      iii. The total transmitted power. 9M

OR

2. a) Derive an expression for single-tone amplitude modulated wave. Also draw its spectra. 6M

   b) Explain briefly the working principle of balanced modulator 6M

   c) Write the advantages of SSB-SC modulation 2M

UNIT–II

3. a) An FM wave is given by $s(t) = 10\cos(16® \times 10^6 t + 20\sin 2® \times 10^3$. Determine
      i. The carrier and modulating frequency
      ii. The modulation index and maximum deviation.
      iii. Power dissipated by this FM wave in a 100 ohm resister 6M

   b) Explain with suitable diagram, how the Narrow band FM signal may be generated. 6M

   c) What is the theoretical bandwidth required for Narrowband FM transmission? Justify. 2M

OR

4. a) Compare AM and Narrowband FM 4M

   b) Between AM and FM which is more noise immune? Why? 2M

   c) A message signal x(t)=100sin(2000)t frequency modulates a carrier signal $C(t) = 200\cos(2® \times 10^8)t$ with a modulation index of 5. Find
      I. Write down the expression for FM signal.
      II. What is the peak frequency deviation?
      III. What is the average power of the modulated signal?
      IV. What is bandwidth of the modulated signal? 8M

UNIT–III

5.	a)	Explain SNR in analog communication system.	4M
	b)	Give the calculation of signal power and noise power in SSB-SC AM system.	8M
	C)	What is white in white noise?	2M

OR

6.	a)	Differentiate between pre-emphasis and de-emphasis.	4M
	b)	Does the reduction in frequency range improve SNR in both SSB and DSB-SC reception? Why?	4M
	c)	What is the threshold effect of FM signal.	6M

UNIT–IV

7.	a)	Explain Variable reactance type and phase modulated FM Transmitter	8M
	b)	Explain briefly about radio transmitter.	6M

OR

8.	a)	Draw the block diagram of super heterodyne receiver and explain the importance of intermediate frequency.	8M
	b)	Explain how frequency stability in FM Transmitter is achieved.	6M

UNIT–V

9.	a)	What is pulse modulation? Explain its advantages over continuous wave modulation. Discuss the application of pulse modulation. Enumerate the types of pulse modulation.	7M
	b)	Describe the operation of PWM and PPM technique.	7M

OR

10.	a)	Write a short note on time division multiplexing	7M
	b)	Explain how multiple channels are multiplexed using FDM. Draw appropriate sketches.	7M

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Hall Ticket Number :										

R-15

Code: 5GC41

II B.Tech. II Semester Regular Examinations May 2017

Complex Variables & Special Functions

(Common to EEE & ECE)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

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

   b) If $\tan(x+iy)=A+iB$, show that $A^2+B^2+2A\cot 2x=1$ 7M

OR

2. a) Given that $\int_0^{\infty}\dfrac{x^{n-1}}{(1+x)}dx=\dfrac{\pi}{\sin n\pi}$ Show that

   $\Gamma(n)\Gamma(1-n)=\dfrac{\pi}{\sin n\pi}$ for $0<n<1$ and hence find $\Gamma\left(\dfrac{1}{4}\right)\Gamma\left(\dfrac{3}{4}\right)$ 7M

   b) Find the real and imaginary parts of $\ln\cos(x+iy)$. 7M

UNIT–II

3. a) State and prove Cauchy-Reimann equations in Cartesian form. 7M

   b) If $v(r,\theta)=\left(r-\dfrac{1}{r}\right)\sin\theta$, $r\neq 0$, then find an analytic function $f(z)=u+iv$. 7M

OR

4. Determine an analytic function $f(z)=u+iv$, if $u-v=\dfrac{\cos x+\sin x-e^{-y}}{2(\cos x-\cosh y)}$ and $f\left(\dfrac{\pi}{2}\right)=0$. 14M

UNIT–III

5. a) Evaluate $\int_c\dfrac{\cos\pi z}{z^2-1}dz$, using Cauchy's integral formula around a rectangle with vertices $2\pm i, -2\pm i$. 7M

   b) Expand $f(z)=\dfrac{(z-1)}{(z+1)}$ in Taylor's series about the point $z=1$. 7M

OR

6. a) Evaluate $\int_c|z|^2\,dz$ around the square with vertices at (0,0), (1,0), (1,1) (0,1) 8M

   b) Expand $f(z)=\dfrac{z}{(z-1)(z-3)}$ for $|z-1|<2$. 6M

UNIT–IV

7. a) Using Cauchy's residue theorem, evaluate $\int_c \frac{e^{2z}}{(z+1)^4}\,dz$, where c is the circle $|z|=2$ 7M

b) Use Rouche's theorem to solve $p(z)=z^4-5z+1$, annulus region $1<|z|<2$. 7M

OR

8. a) Evaluate $\int_c \frac{(z-3)}{z^2+2z+5}\,dz$, where c is the circle $|z+(1+i)|=2$. 7M

b) Evaluate $\int_c \frac{f'(z)}{f(z)}\,dz$ where $f(z)=\frac{(z^2+1)^2}{(z^2+2z+2)^3}$, $c: |z|=4$ 7M

UNIT–V

9. a) Show that the straight lines parallel to the co-ordinate axes in the z-plane maps onto parabolas in the w-plane under the transformation $w=z^2$. Indicate the region with sketches. 7M

b) Find the bilinear transformation which maps $z=1,\ i,-1$ into $w=0,1,\infty$ Also find the fixed points of the transformation. 7M

OR

10. a) Show that the transformation $w=\frac{i(1-z)}{(1+z)}$ maps the circle $|z|=1$ into the real axis of the w-plane and the interior of the circle $|z|<1$ into the upper half of the w-plane. 7M

b) Find the bilinear transformation which maps the points $z=-1,\ i,\ 1$ into $w=1,\ i,-1$. Also find its invariant points. 7M

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Hall Ticket Number :										

R-15

Code: 5G246

II B.Tech. II Semester Regular Examinations May 2017

Electrical Technology

(Electronics and Communication Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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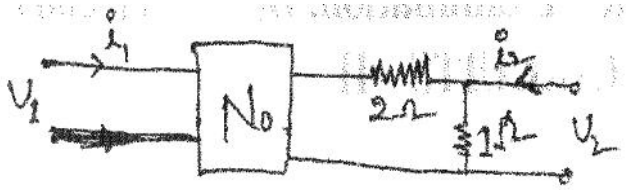
UNIT–I

1. a) In the arrangement of figure given below

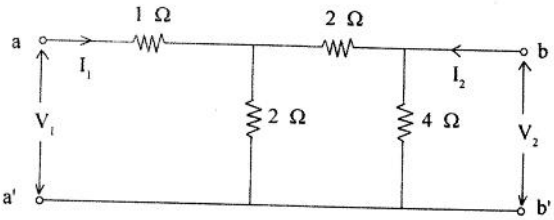


If $\begin{bmatrix} V_1 \\ I_1 \end{bmatrix} = \begin{bmatrix} 30 & 23 \\ 13 & 10 \end{bmatrix} \begin{bmatrix} V_2 \\ -I_2 \end{bmatrix}$ then **find** A, B, C, D Parameters. 7M

b) **Develop** necessary expression for Y parameters in terms of Z parameters. 7M

OR

2. a) **Find** Y parameters for the network

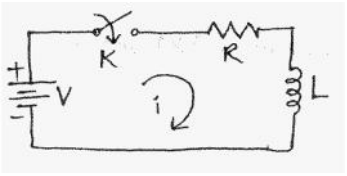


7M

b) Show that when two 2-port networks N1 and N2 are connected in parallel the equivalent Y-parameters of the combined network is the sum of Y-parameters of each individual 2-port network. 7M

UNIT–II

3. a) In the given network ,switch k is closed at t=0 with zero current in inductor .Find the values of I, di/dt and d^2i/dt^2 at t-0+ if R=10 Ω, L= 1 H and V=100V

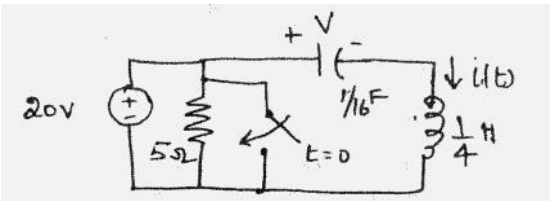


7M

b) **Develop** expression for current in series RLC circuit with DC excitation. 7M

OR

4. a) **Determine** i(t) for t>0 in the circuit shown below



7M

b) The switch in the circuit has been closed for a long time when the switch is opened at t=0 a) i_L (t) for t>0 b) **Determine** i_L (10 m sec) c)t_1 if i_L (t_1) =0.5 i_L(0) 7M

UNIT–III

5. a) **Relate** the characteristics of pass band and stop band filters, explain them. 7M

   b) **Discuss** about constant k low pass and high pass filters. 7M

OR

6. a) **Design** constant k high pass filter with characteristic impedance of 600 ohms and to pass frequency above 20kHz. 7M

   b) **Design** T- type attenuator to provide attenuation of 25 dB. Take characteristic impedance of 100 ohms. 7M

UNIT–IV

7. a) **Explain** various methods of speed control of dc shunt motor. 7M

   b) **Explain** and draw characteristics of dc generator and dc motor. 7M

OR

8. a) **Discuss** torque equation of dc motor 7M

   b) **Explain** about three point starter. 7M

UNIT–V

9. a) **Explain** how the efficiency of a transformer may be estimated from open circuit and short circuit tests. 7M

   b) **Justify** the statement " single phase motor is not self starting" 7M

OR

10. a) **Explain** the operation of capacitor start and capacitor run motor 7M

    b) **Discuss** stepper motor and its characteristics. 7M

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Hall Ticket Number :										

R-15

Code: 5G344

II B.Tech. II Semester Regular Examinations May 2017

Field Theory and Transmission Lines

(Electronics and Communication Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. a) Prove that divergence of a curl of a vector is zero ,using Stoke's theorem 7M

   b) State Ampere's circuit law. A hollow conducting cylinder has inner radius' a' and outer radius 'b' and carries current I along the positive Z direction. Find H everywhere. 7M

OR

2. a) Define electric field intensity interms of point charge and describe its salient features. 7M

   b) Two point charges Q_1 = 5.0C and Q_2 = 1.0 nC are located at (-1, 1,-3) m and (3, 1, 0) m respectively. Determine the electric field at Q_1 and Q_2 .Explain the steps. 7M

UNIT–II

3. a) Derive an expression for the capacitance of a parallel plate capacitor having two dielectric media. 7M

   b) The capacitance of the conductor formed by the two parallel metal sheets, each 100cm^2, in area separated by a dielectric 2mm thick is, 2×10^{-10} micro farad, a potential of 20KV is applied to it. Find (i) Electric flux (ii) Potential gradient in kV/m (iii) The relative permittivity of materials (iv) Electric flux density. 7M

OR

4. a) Derive an expression for the capacitance of two wire transmission line. 7M

   b) Drive an expression for energy stored and energy density in electrostatic field 7M

UNIT–III

5. a) Derive the expressions for magnetic flux intensity due to solenoid of the coil. 5M

   b) Define magnetic vector potential. Derive expressions for potential functions of sinusoidal oscillating functions. 9M

OR

6. a) Derive the expression for torque developed in a rectangular closed circuit carrying current I in an uniform field. 7M

   b) An iron ring with a cross sectional area of 3cm^2 and mean circumference of 15 cm is wound with 250 turns wire carrying a current of 0.3A.The relative permeability of ring is 1500. Calculate the flux established in the ring. 7M

UNIT–IV

7. a) State and derive complex pointing theorem. 7M

   b) Assume that E and H waves, traveling in free space, are normally incident on the interface with a perfect dielectric with ε_r =3. Calculate the magnitudes of incident, reflected and transmitted E and H waves at the interface. 7M

OR

8. a) Derive the expression for the attenuation constant, phase constant and intrinsic impedance for a uniform plane wave in a good conductor. 7M

   b) Derive the one dimensional general wave equation and find the solution for wave equation. 7M

UNIT–V

9. a) Explain the effect of inductance loading in telephone cables in detail. 5M

   b) A 75 ohm transmission line, $\lambda/2$ long is terminated in a load resistance of 300 ohms. Determine its input impedance. If the same line is then operated at a frequency half of the original operating frequency, then what would be its effect on the Z_{in} ? 9M

OR

10. a) Derive the Z_{in} equations for Quarter wave line and Half wave line. Mention their applications. 7M

    b) Derive the circle equations of smith chart. 7M

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Hall Ticket Number :										

R-15

Code: 5G342

II B.Tech. II Semester Regular Examinations May 2017

Pulse and Digital Circuits

(Electronics and Communication Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

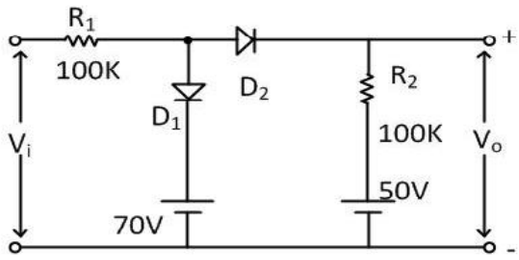
1. a) Explain the response of high pass RC circuit with the help of waveforms.
   i) Pulse input ii) Ramp input 7M
   b) Explain how an RC high pass circuit acts as a differentiator 7M

OR

2. a) Analyze the low pass RC circuit for the following inputs, with the help of wave forms
   i) Square input ii) Step input 7M
   b) Explain how an RC low pass circuit acts as an integrator 7M

UNIT–II

3. a) With the help of neat circuit explain the working of negative clamping circuit. What is the effect of Rs & R_f is clamping circuit output. 7M
   b) The input voltage of the two level clipper is varying linearly from 0 to 100 V. Draw the output waveform and transfer characteristics.



7M

OR

4. a) Write a short note on how transistor acts as a switch. 7M
   b) Explain the need for clamping circuits 7M

UNIT–III

5. Find Lower and Upper Threshold voltage for Schmitt trigger circuits with following data. Assume transistors with hfe=30, V_{CC}=12V, R_{C1}=4K, R_{C2}=1K, R1=2K, Rs=1K, R_2=6K, Re=3K. 14M

OR

6. What is a Monostable Multivibrator. Explain with the help of neat circuit diagram, the principle of operation of mono stable multivibrator and derive an expression for pulse width. Draw the waveforms at collector and bases of both transistors. 14M

UNIT–IV

7. a) Explain the basic principles of miller and Bootstrap time base generator. 7M
   b) Write the general features of a time base signal. 7M

OR

8. a) Discuss about the simple current sweep circuit. 7M
   b) Explain about the linearly correction through adjusting of driving waveform. 7M

UNIT–V

9. a) What is sampling Gate? And explain the basic operating principle of gates? 7M
   b) Explain the operation of unidirectional diode gate 7M

OR

10. a) What are the different logic systems? Explain them? 7M
    b) Prove that NAND and NOR gates are universal gates. 7M

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Hall Ticket Number :										

R-15

Code: 5G341

II B.Tech. II Semester Regular Examinations May 2017

Random Variables and Random Processes

(Electronics and Communication Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. a) Define probability and state the three axioms of probability

   b) Define random variable and explain the conditions for a function to be a random variable

   c) In a lot of 100 chips (semiconductor) 20 are defective .Two chips are selected at random without replacement , from the lot

      i. What is the probability that the first one selected is defective.
      ii. What is the probability that the second one selected is defective. Given that the first one selected is defective.
      iii. What is the probability that both are defective?

OR

2. a) Define probability density function and state its properties

   b) In a communication system three symbols 0, 1, 2, are transmitted. The events are Ai and Bj , where i= 1,2,3 and j= 1,2,3 to represent symbols after and before the channel respectively . The channel transition probabilities are all equal at p(Ai/Bj)=0.1 , for i j and p(Ai/Bj)=0.8 for i=j =1,2,3 ,while symbol transmission probabilities are p(B1)=0.5 , p(B2)=0.3 p(B3)=0.2

      i. compute the received symbol probabilities P(A1),P(A2),P(A3).
      ii. compute the error probabilities .

UNIT–II

3. a) Define expectation of a random variable& obtain the variance of a uniformly distributed random variable whose probability density function is given by

   $f_{x,}(x)=\frac{1}{b-a}$ a<x<b

   b) A military installation has six similar radars placed in operation. the radars probability of failing to operate before 500 hours of "on " time have accumulated is 0.06.what are the probabilities that before 500 hours have elapsed (i) all will operate (ii) all will fail (iii) only one will fail .

OR

4. a) Show that the mean and variance of a poisson distributed random variable are equal.

   b) The notation μ_n denotes the n^{th} central moment then prove that $\mu_0=1$ $\mu_1=0$ μ_2=variance.

UNIT–III

5. a) Define the joint density function of c and prove its properties.

   b) The joint density function of two random variables X&Y , $f_{x,y}(x,y) = a(2x+y^2)$,0<x<2, 2<y<4. find (i) the value of 'a' (iii) P{x<1,y>3}

OR

6. a) Show that for two random variables X&Y , to be statistically independent $f_{x,y}(x,y) = f_{x,}(x)\, f_y(y)$

   b) The joint density function of two random variables X&Y , $f_{x,y}(x,y) = 0.25(e^{-|x|-|y|})$ $-\infty < x < \infty$ $-\infty < y < \infty$

   i. Are the random variables X and Y statistically independent.
   ii. Find the probability of the event p{X<=1,Y<=0}.

UNIT–IV

7. a) Define a Random process, what are the conditions for a random process to be wide sense stationary.

   b) An ergodic random process X(t) has an autocorrelation function

$$R_{XX}(s) = 18 + \frac{2}{6+s2}(1+4\cos(12s))$$

   i. Find mean of X(t)
   ii. Average power in X(t)
   iii. Is x(t) consisting of any periodic components.

OR

8. a) If X(t) is a wide sense stationary random process with autocorrelation function R_{xx} (t,t+s),state any four properties of autocorrelation and prove them.

   b) Show that the random process X(t)=Acos (Wt+Ω) is wide sense stationary if it is assumed that A andW are constants andΩ is a uniformly distributed random variable on the interval (0,2π)

UNIT–V

9. a) Define power spectral density of a random process X(t) and state its properties with necessary proof.

   b) Which among the following are valid power spectral density functions

$$\frac{COS8w}{2+w4} \qquad e^{-(w-1)2} \qquad \frac{w2}{w6+3w2+3}$$

OR

10. a) Show that the autocorrelation function and power spectral density are a fourier transform pair.

    b) The autocorrelation function of a wide sense stationary random process is

$$R_{XX}(s) = ke^{-|s|k}$$

obtain its power spectral density .

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