| Hall Ticket Number : | | | | | | | | | | |
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**R-15**

**Code: 5G343**

II B.Tech. II Semester Supplementary Examinations Nov/Dec 2019

# 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) Explain working of simple AM transmitter with neat diagram and describe its blocks. 7M

   b) Derive the expression for the Modulation efficiency of the AM signal. 7M

**OR**

2. a) Explain the working principle of DSB-SC modulator with neat block diagram. 10M

   b) What is VSB? What is significance VSB. 4M

**UNIT–II**

3. a) Draw the block diagram of Armstrong method for generating a FM signal and quote its working principle. 10M

   b) Compare of FM & AM. 4M

**OR**

4. a) Explain principle of operation of Balanced slope-detector for detecting the FM signal. 7M

   b) The FM signal has a sinusoidal modulation frequency 20KHz and a modulation index β=2.5. Find the transmission bandwidth of FM using Carson's rule. 7M

**UNIT–III**

5. a) Derive an expression for output SNR for DSB-SC system. 7M

   b) Write note on noise in Angle Modulation System and SNR Calculation. 7M

**OR**

6. a) The available output noise power from an amplifier is 80 nW, the available power gain of the amplifier being 40 dB and the equivalent noise bandwidth being 25 MHz. Calculate the noise figure, assuming $T_0$ to be $27^0$ C. 7M

   b) Verify that both AM-DSB-SC and AM-SSB-SC are of same noise performance. 7M

**UNIT–IV**

7. a) Classify the radio Receivers based on type of modulation and service involved. 7M

   b) Analyze AM transmitters with modulation at high carrier power level. 7M

**OR**

8. a) Draw the block schematics of super heterodyne receiver and explain the operation of each block. 7M

   b) List and define the performance parameters of radio receivers in detail. 7M

**UNIT–V**

9. a) Describe with suitable circuit, the scheme of generation of PAM signals. 4M

   b) Explain why a single channel PPM system requires the transmission of synchronization signal, where as a single channel PAM or PDM system does not. 10M

**OR**

10. a) Describe with suitable circuit, the scheme of generation of PPM signals. 7M

    b) Explain the method of generation and detection of PAM signals with neat schematics. 7M

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| Hall Ticket Number : | | | | | | | | | | |
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**R-15**

**Code: 5GC41**

II B.Tech. II Semester Supplementary Examinations Nov/Dec 2019

# Complex Variables and 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 $(m,n)=\frac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$ 7M

   b) If cosh(u + iv) = x + iy, prove that

   (i) $\frac{x^2}{\cosh^2 u}+\frac{y^2}{\sinh^2 u}=1$ (ii) $\frac{x^2}{\cos^2 v}-\frac{y^2}{\sin^2 v}=1$ 7M

**OR**

2. a) Evaluate $\int_0^\infty e^{-ax}x^{m-1}\sin bx\,dx$ in terms of Gamma function. 7M

   b) Separate the real and imaginary parts of (i) $\sinh(x+iy)$ (ii) $\cosh(x+iy)$ 7M

**UNIT–II**

3. a) Prove that the function $f(z)$ defined by $f(z)=\frac{x^3(1+i)-y^3(1-i)}{x^2+y^2}(z\neq 0), f(0)=0$ is continuous and the Cauchy Riemann equations are satisfied at the origin, yet $f'(0)$ does not exist. 7M

   b) Find the conjugate harmonic of $v(r,\theta)=r^2\cos 2\theta - r\cos\theta + 2$. Show that $v$ is harmonic. 7M

**OR**

4. a) Determine the analytic function

   $f(z)=u+iv$ if $u-v=\frac{\cos x+\sin x-e^{-y}}{2(\cos x-\cosh y)}$ and $f\left(\frac{\pi}{2}\right)=0$. 7M

   b) Derive Cauchy-Riemann equations in polar coordinates. 7M

**UNIT–III**

5. Find the Taylor's expansion of $f(z)=\frac{2z^3+1}{z^2+z}$ about the point $z=i$. 14M

**OR**

6. If $f(z)$ is analytic inside a circle $C$ with centre at $a$, then for z inside $C$ prove that

   $$f(z)=f(a)+f'(a)(z-a)+\frac{f''(a)}{2!}(z-a)^2+\text{----}+\frac{f^n(a)}{n!}(z-a)^n+\text{----}$$ 14M

**UNIT–IV**

7. a) State and prove Residue theorem. 7M

b) Evaluate $\int_0^{\infty} \frac{\cos ax}{x^2+1} dx$. 7M

**OR**

8. a) Find the residue of $f(z) = \frac{z^2}{(z-1)^4(z-2)(z-3)}$ at its poles and hence evaluate $\int_C f(z)dz$ where $C$ is the circle $|z| = 2.5$. 7M

b) Show that $\int_0^{2®} \frac{\cos 2^{-}}{1-2a\cos^{-}+a^2} d^{-} = \frac{2® a^2}{1-a^2}, (a^2 < 1)$ 7M

**UNIT–V**

9. Find the bilinear transformation which maps the points z = 1, i, -1 onto the points w = i, 0, -i. Hence find the image of $|z| < 1$, 14M

**OR**

10. Show that the transformation effected by an analytic function $w = f(z)$ is conformal at every point of the Z-plane where $f'(z) \neq 0$. 14M

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| Hall Ticket Number : | | | | | | | | | | |
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**R-15**

**Code: 5G246**

II B.Tech. II Semester Supplementary Examinations Nov/Dec 2019

# 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) Explain in detail about the Hybrid parameters with example. 7M

   b) Determine the image parameters of the T network shown in figure 1.

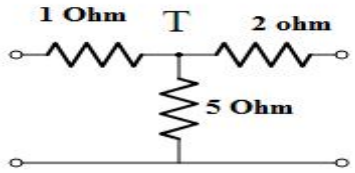


Fig.1 7M

**OR**

2. a) Obtain the Conditions for Reciprocity & Symmetry for Z and Y parameters. 7M

   b) Obtain the expression of ABCD parameters in terms of Z and Y parameters. 7M

## UNIT–II

3. a) What are the different types of transients? 4M

   b) Obtain the DC response of Series RL Circuit. 10M

**OR**

4. Obtain the DC response of Series RLC Circuit. 14M

## UNIT–III

5. a) Derive the design equations for Lattice type attenuator? 6M

   b) What is attenuator? Design a T-section symmetrical attenuator to provide a voltage attenuation of 15 dB and having a characteristic impedance of 500 Ω? 8M

**OR**

6. Design an m derived T-section filter with a cut off frequency 10KHZ design impedance of 200 Ω and m=0.4. 14M

## UNIT–IV

7. a) Write the applications of different types of DC motors? 4M

   b) Draw and explain magnetization and load characteristics of DC shunt generator? 10M

**OR**

8. Explain in detail about various losses and various efficiencies of DC Generators. 14M

## UNIT–V

9. a) What is the need of a transformer? 5M

   b) Explain the Constructional details of transformer with necessary figures. 9M

**OR**

10. a) Derive the EMF Equation of a transformer. 7M

    b) Explain the working principle of a transformer. 7M

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| Hall Ticket Number : | | | | | | | | | | |
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**R-15**

**Code: 5G342**

II B.Tech. II Semester Supplementary Examinations Nov/Dec 2019

# 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) Design and find the response of a Low Pass Circuit for Symmetrical Square wave input for different time constants. Also, derive the corresponding voltage expressions. 10M

   b) What is a Ringing circuit? Draw and explain its operation. 4M

**OR**

2. a) Which RC circuit acts as a Differentiator? Under what condition, it acts as a Differentiator? Derive that condition. 6M

   b) Determine and plot the frequency response of a Low Pass circuit for Sinusoidal input. Also, derive the necessary equations. 8M

**UNIT–II**

3. a) Design Diode as Switch circuit and then verify its functionality. 4M

   b) Design any three different positive and Negative Clipper circuits with and without biasing and then draw the corresponding input, output waveforms and transfer characteristics. 10M

**OR**

4. a) Illustrate different Transistor switching times and Diode switching times and then define all of them. 10M

   b) State and prove clamping circuit theorem. 4M

**UNIT–III**

5. a) What is the need of triggering? What is the difference between symmetrical and unsymmetrical triggering? 4M

   b) A fixed bias Bistable has the following circuit parameters: $R_c$ = 1kΩ, $R_1$=3.9kΩ, Vcc = +9v and $V_{BB}$ = -9v. Assume for transistor $V_{CEsat}$ = 0v, $V_{BEsat}$=0.6v and $V_{BE(cutoff)}$ = 0v. Analyse the binary, and find the stable state voltages and currents. What is the minimum value of $h_{FE}$ to satisfy the ON-OFF condition? 10M

**OR**

6. a) Define the terms: stable state, semi-stable state, Duty cycle and Multivibrator. 4M

   b) Design a Monostable multivibrator circuit. Explain the principle of operation with the help of the wave forms at collector and bases of both Transistors. Also, derive an expression for pulse width. 10M

**UNIT–IV**

7. a) Mention the drawbacks of the transistor voltage sweep waveform generator and suggest the methods for eliminating those drawbacks. 5M

   b) With the help of the circuit diagram and expressions, explain the working of transistor Miller time base generator. 9M

**OR**

8. a) Define sweep speed, displacement and transmission errors. Also, derive the relation between them. 7M

   b) Draw a simple current sweep circuit and explain its working with the help of diagrams. 7M

**UNIT–V**

9. a) Define fan-In, fan-out, Propagation delay, noise margin, logic levels and Power dissipation. 6M

   b) Draw the circuit diagram of DTL OR gate and explain its operation. 5M

   c) Define and illustrate positive and negative pulse logic systems. 3M

**OR**

10. a) What is pedestal? How it effect the output of a sampling gate? What are the applications of sampling gates? 5M

    b) Illustrate with neat circuit diagram, the operation of unidirectional sampling gate for multiple inputs. 4M

    c) Design a CMOS logic NAND gate and then explain its operation. 5M

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| Hall Ticket Number : | | | | | | | | | | |
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**R-15**

**Code: 5G344**

II B.Tech. II Semester Supplementary Examinations Nov/Dec 2019

# 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) Show that the electric field intensity due to infinite line charge is $E = \frac{\rho_L}{2\pi\varepsilon_0\rho}a_\rho$ 7M

   b) A charge of $-0.3\ \mu C$ is located at $A(25, -30, 15)\ cm$, and a second charge of $0.5\ \mu C$ is at $B(-10, 8, 12)\ cm$. Find E at: (i) the origin; (ii) $P(15, 20, 50)\ cm$. 7M

**OR**

2. a) Show that the energy density stored in electrostatic field is $W_E = \frac{1}{2}\varepsilon E^2$ 7M

   b) If $V = x - y + xy + 2z$ V, find **E** at (1, 2, 3) and electrostatic energy stored in a cube of side 2 m centered at the origin 7M

## UNIT–II

3. a) Derive the continuity equation and relaxation time 7M

   b) Find out the equivalent capacitance of two capacitors connected in (i) series (ii) parallel. 7M

**OR**

4. a) Discuss polarization in dielectrics 7M

   b) For the current density in dielectrics $J = 10\sin^2\varphi\, a_\rho\ A/m^2$, find the current passing through the cylindrical surface $\rho = 2, 1 \le z \le 5\ m$. 7M

## UNIT–III

5. a) State and explain Biot-Savart law 6M

   b) Find out the magnetic field intensity due to infinite length solenoid 8M

**OR**

6. a) Write the Maxwell's equation for time varying fields and give their word statement. 6M

   b) A current distribution gives rise to the vector magnetic potential $A = x^2 y\, a_x + y^2 x\, a_y - 4xyz\, a_z\ Wb/m$. Calculate

   (i) $B\ at\ (-1, 2, 5)$

   (ii) The flux through the surface defined by $z = 1, 0 \le x \le 1, -1 \le y \le 1$ 8M

## UNIT–IV

7. a) Derive the wave equation for dielectric medium 6M

   b) In free space, $H = 0.1\cos(2 \times 10^8 t - kx)a_y\ A/m$

   (i) Calculate k, λ and T

   (ii) Calculate the time $t_1$ it takes the wave to travel λ/8

   (iii) Sketch the wave at time $t_1$. 8M

**OR**

8. a) Define and derive skin depth 6M

   b) A lossy dielectric has an intrinsic impedance of $200\angle 30_{o}\ \Omega$ at a particular radian frequency ω. If at the frequency, the plane wave propagating through the dielectric has the magnetic field component

$$H = 10e^{-\alpha x}\cos\left(\omega t - \frac{1}{2}x\right) a_y\ A/m$$

   Find E and α. Determine the skin depth and wave polarization. 8M

**UNIT–V**

9. a) Derive the equations for characteristic impedance, attenuation constant and phase constant of a transmission line 7M

   b) A transmission line operating at 500 MHz has $Z0 = 80\ \Omega, \alpha = 0.04\ \frac{Np}{m}, \beta = 1.5\ rad/m.$ Find the line parameters R, L, G, C. 7M

**OR**

10. a) Define and derive the equations for wavelength, phase velocity and group velocity of transmission line 7M

    b) A telephone line has $R = \Omega/km, L = 100\ mH/km, G = \ and\ C = 20\ \mu F/km.$ At $f = KHz$, obtain

    (i) The characteristic impedance of the line
    (ii) The propagation constant of the line
    (iii) The phase velocity 7M

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| Hall Ticket Number : | | | | | | | | | | |
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**R-15**

**Code: 5G341**

II B.Tech. II Semester Supplementary Examinations Nov/Dec 2019

# 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) Explain about uniform and conditional random variable 7M

   b) Differentiate Probability Distribution Function and Probability Density Function. List properties of density function. Write note on PDF and CDF of Gaussian Random Variable. 7M

**OR**

2. a) List and explain properties of conditional distribution 7M

   b) Find the mean of an exponential distribution. 7M

## UNIT–II

3. a) Discuss concepts of moment generation function and characteristic function of random variable. 8M

   b) Define central moment, variance and skew. 6M

**OR**

4. a) Determine the mean value of following exponential function:

$$f_x(x) = \begin{cases} \frac{e^{-(x-a)/b}}{b} & x > a \\ 0 & x < a \end{cases}$$

   Then from that result calculate variance and skew of the same. 8M

   b) Write note on Chebyshev's inequality. 6M

## UNIT–III

5. a) State joint density function and discuss the properties of joint density function. 7M

   b) Explain interval conditioning and statistical independence of multiple random variables 7M

**OR**

6. a) List the properties of multiple random variables. Discuss central limit theorem for sum of large Radom variable. 7M

   b) Mathematically discuss the concepts of two and N Gaussian random variable. 7M

## UNIT–IV

7. a) Define random process and state some useful classifications of random process 6M

   b) Given the random process X(t)= A Sin(ωt+θ), A, ω are constants and θ is an uniformly distributed random variable in the interval (-π, π). Define a new random process $Y(t)=X^2(t)$. Find:

      i. Autocorrelation function of Y(t)
      ii. Find the cross correlation function of X(t) and Y(t) 8M

**OR**

8. a) Write a note on covariance function of random processes 7M

   b) Given the random process $y(t)=x(t)\cos(\omega t+\theta)$, where $x(t)$ is a wide sense stationary random process that amplitude modulates a carrier of constant angular frequency . With a random phase $\theta$ independent of $x(t)$ and uniformly distributed in the interval ), $(-\pi\ \pi)$ Find:
      i. $E(y(t))$
      ii. Find the autocorrelation function of $y(t)$ 7M

**UNIT–V**

9. a) Discuss the relationship between power density spectrum and autocorrelation function 7M

   b) Find the power spectrum of random process with the following function as autocorrelation $R_{xx}(t)=(A^2/2)\cos(\omega_0 t)$ 7M

**OR**

10. a) Discuss properties of cross power density spectrum 7M

   b) Consider two Gaussian process x(t) and y(t) with mean m1 , m2 and variance v1,v2 respectively.
      i. Find the cross Power Spectral Density (PSD) ) $S_{xy}(w)$ and $S_{yx}(w)$
      ii. Show that cross PSD function $S_{xy}(w)$ or $S_{yx}(w)$and cross-correlation function $R_{xy}(T)$ or $R_{yx}(T)$ both are Fourier transform pair. 7M

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