Hall Ticket Number :

**R-14**

**Code: 4G343**

II B.Tech. II Semester Supplementary Examinations May 2018

# 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) Describe AM wave by considering single modulating signal. Draw its time and frequency domain representation. 7M

   b) What is the effect of phase and frequency error in demodulation of SSB wave using synchronous detector. Explain in detail. 7M

**OR**

2. a) Explain the generation of DSBSC wave using balanced modulator 6M

   b) Derive the canonical expression for Vestigial Side Band (VSB) wave. How it is used in TV broadcast? 8M

**UNIT–II**

3. a) What is a PLL? Assuming the linear model, explain with expressions, how PLL can be used as FM detector. 6M

   b) Explain the working of a balanced frequency discriminator with the help of circuit diagram. 8M

**OR**

4. a) Explain in detail about NBFM and WBFM. Derive the expression for bandwidth of wideband FM. 9M

   b) A single tone FM signal is given by $V(t) = 10\sin(16\text{®} \times 10^{6} t) + 20\sin(2\text{®} \times 10^{3} t)$ volts. Determine the modulation index, modulating frequency, frequency deviation, carrier frequency and the power of the FM signal. 5M

**UNIT–III**

5. a) Discuss the noise performance of AM system using envelop detection? 8M

   b) What is FM threshold effect? How to achieve threshold reduction in FM system? 6M

**OR**

6. a) What is the need of pre-emphasis and de-emphasis in FM transmission? Sketch their frequency response. How are these of avail in FM systems? 7M

   b) Define Figure of Merit (FoM). Derive the expression for FoM of SSB-SC system. 7M

**UNIT–IV**

7. a) Draw the block diagram of a super heterodyne receiver and explain its operation? What are the advantages of this receiver? 7M

   b) What are image frequency and its rejection? In a broadcast super heterodyne receiver having no RF amplifier, the loaded Q of the antenna coupling circuit is 100. If the IF frequency is 455kHz, determine the image frequency and its rejection ratio for tuning at (a) 1.1kHz & (b) 25kHz. 7M

**OR**

8. a) What is simple Automatic Gain Control (AGC)? What are its functions? What is delayed AGC and what are its merits compared to simple AGC? 8M

   b) Discuss the considerations in the choice of IF and the design of IF stage. 6M

**UNIT–V**

9. a) Explain the concept of TDM and FDM clearly. 10M

   b) Compare TDM and FDM. 4M

**OR**

10. a) Compare PAM, PWM and PPM. 4M

    b) Explain how PPM and PWM signals are generated from PAM signals. Also, explain how they are detected. 10M

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| Hall Ticket Number : | | | | | | | | | | |
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**R-14**

**Code: 4G245**

II B.Tech. II Semester Supplementary Examinations May 2018

# 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) Define and obtain transmission parameters by taking any one example? 8M
   b) The Z-parameters of a two-port network are $Z_{11}$=10 Ω, $Z_{22}$=20 Ω, $Z_{12}$=$Z_{21}$=5Ω. Find the ABCD parameters. 6M

**OR**

2. a) What is the use of *h*-parameters? Derive equations to determine these parameters. State the condition for symmetry and Reciprocity in a two port network in terms of “h” parameters. 10M
   b) Obtain “Z” parameters in terms of “Y” parameters for a two port network. 4M

**UNIT–II**

3. a) What are the different types of transients? 4M
   b) A 20 ohm resistor, a 0.01 h inductor and a 100 µF capacitor are connected in series. A d.c. voltage of 100 V is suddenly applied to the circuit. Obtain the equation showing how the current through the circuit is varies with time. Find the maximum current and the time at which it occurs? 10M

**OR**

4. a) Explain in detail about the transients in R-C series circuit with DC Excitation? 8M
   b) A circuit of resistance 10 ohms and the inductance of 0.1 H in series has a direct voltage of 200 V suddenly applied to it. Find the voltage drop across inductance at the instant of switching on and at 0.01 second? 6M

**UNIT–III**

5. a) Define filter and write short notes on low-pass filter? 6M
   b) A filter is required to pass all frequencies above 25 kHz and to have a nominal impedance of 600 Ω. Design (i) a high-pass T section filter and (ii) a high-pass π- section filter to meet these requirements? 8M

**OR**

6. a) 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? 6M
   b) Derive the design equations for Lattice type attenuator? 8M

**UNIT–IV**

7. a) Derive the EMF Equation of a DC Generator? 4M
   b) Explain how the speed of a DC shunt motor is controlled through flux and armature control method? 10M

**OR**

8. a) Write the applications of different types of DC motors? 4M
   b) Draw and explain magnetization and load characteristics of DC shunt generator? 10M

**UNIT–V**

9. a) Explain OC and SC tests of a 1-phase transformer with a neat circuit diagram? 10M
   b) A 11000/400 V distribution transformer takes a no load primary current of 1 A at a power factor of 0.24 lagging. Find: (i) Core loss current. (ii) Magnetizing current. (iii) Iron loss. 4M

**OR**

10. a) Explain the construction of hybrid stepper motor with diagram? 10M
    b) Write the advantages of capacitor start and run single phase induction 4M

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**R-14**

**Code: 4G344**

II B.Tech. II Semester Supplementary Examinations May 2018

# 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) State and Explain Coulomb's law using vector form of coulomb's force expression. 7M

   b) Let J= 400 sinθ/($r^2$+4) $\mathbf{a}_r$ A/$m^2$. Find the total current flowing through that portion of the spherical surface r=0.8 bounded by 0.1π<θ<0.3 π , 0<φ<2 π 7M

**OR**

2. a) State and prove Gauss law for arbitrary shaped closed body. 7M

   b) A potential field is given as V=100$e^{-5x}$ sin3y cos4z Volts. Let the point P(0.1,pi/12, pi/24) be located at a conductor free space boundary. At point P, find i) **E** ii) **D** iii) $\rho_s$ 7M

**UNIT–II**

3. a) A conductor is called as "Equipotential Body". State yes or no. and Justify the statement with the necessary mathematical equations. 6M

   b) If J = (1/$r^3$). (2 cos θ $\mathbf{a}_r$ + sin θ $\mathbf{a}_\varphi$) A/$m^2$, calculate the current passing through a
      i) Spherical shell of radius of 10 cm
      ii) Hemispherical shell of radius of 20 cm 8M

**OR**

4. a) A circular disc of 10 cm is charged uniformly with a total charge of 10 Coulombs. Find Electric field intensity at a point 20 cm away from the disc along the axis. 7M

   b) Distinguish between the conduction and convection currents. Calculate the relaxation time for Brass material, having conductivity of 1.1x$10^7$ mho/m at 10 MHz. 7M

**UNIT–III**

5. a) What will be the nature of force between the two current elements if the currents are in the same & opposite directions, explain with necessary derivations 7M

   b) Establish the fields in the different regions of coaxial carrying a current I, and sketch their variation with radial distance. 7M

**OR**

6. a) What is the force experienced by a charge in a magnetic field? Obtain Lorents force equation. 7M

   b) Write a short note on Inductances 7M

**UNIT–IV**

7. a) Derive the relations between E & H in a uniform plane wave. Find the value of intrinsic impedance of free space. 8M

   b) Derive the expression for attenuation and phase constants of uniform plane wave in a good dielectric 6M

**OR**

8. a) Derive the expressions for reflection and transmission coefficients, when a uniform plane wave incidents normally on surface of a perfect dielectric 8M

   b) A uniform plane wave is incident normally on a infinitely thick slab of material with 25 V/m electric field. The material has a dielectric constant 4. How much power penetrates the material slab? 6M

**UNIT–V**

9. a) Derive the expression for the transmission line equation 6M

   b) A lossless transmission line having Z0=120πΩ is operating at ω=5x108 rad/s. If the velocity on the line is 2.4x108 m/s find L & C. Let ZL be represented by an inductance of 0.6μH in series with a 100 Ω resistance. Find reflection coefficient and VSWR. 8M

**OR**

10. a) Derive the characteristic impedance of the transmission line in terms of its line constants 7M

    b) Explain how to find the length and the distance of double stub in transmission line matching 7M

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| Hall Ticket Number : | | | | | | | | | | |
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**Code:** 4GC41

**R-14**

II B.Tech. II Semester Supplementary Examinations May 2018

# Mathematics-III

( Common to EEE and 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) Evaluate $\int_0^1 \left(\log\frac{1}{y}\right)^{n-1} dy,\ (n > 0)$. 6M

   b) Separate $\tan^{-1}(x+iy)$ into real and imaginary parts. 8M

**OR**

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

   b) If $\tan(\theta + i\varphi) = e^{i\alpha}$, show that $\theta = \left(n+\frac{1}{2}\right)\frac{\pi}{2}$ and $\varphi = \frac{1}{2}\left\{\log\tan\left(\frac{\pi}{4}+\frac{\alpha}{2}\right)\right\}$ 7M

## UNIT–II

3. a) Show that the function $f(z) = \sqrt{|xy|}$ is not analytic at the origin even though CR equations are satisfied thereof. 7M

   b) Find the analytic function whose real part is $\frac{\sin 2x}{\cosh 2y - \cos 2x}$ 7M

**OR**

4. a) Find the analytic function $f(z) = u + iv$, if $u - v = (x-y)(x^2+4xy+y^2)$ 7M

   b) Show that $u = \frac{1}{2}\log(x^2+y^2)$ is harmonic. 7M

## UNIT–III

5. a) Evaluate $\int_0^{2+i} (\bar{z})^2\, dz$, along the line $y = \frac{x}{2}$ 7M

   b) Using Cauchy's integral formula, evaluate $\oint_C \frac{\sin\pi z^2+\cos\pi z^2}{(z-1)(z-2)}\,dz$, where $C$ is the circle $|z| = 3$ 7M

**OR**

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

   b) Find the Laurents series expansion of $\frac{z^2-6z-1}{(z-1)(z-3)(z+2)}$ in the region $3 < |z+2| < 5$ 7M

## UNIT–IV

7. a) Find the residues of $f(z) = \frac{z^3}{(z-1)^4(z-1)(z-3)}$ at its poles. 7M

   b) By integrating around a unit circle, Evaluate $\int_0^{2\pi} \frac{\cos 3\theta}{5-4\cos\theta}\,d\theta$ 7M

**OR**

8. a) State and prove Argument principle. 7M

   b) Determine the poles of the function $f(z) = \frac{z^2}{(z-1)^2(z+2)}$ and the residue at each pole. 7M

## UNIT–V

9. a) Find the bilinear transformation which maps the points $z = 1, i, -1$ onto $w = i, 0, -i$ 7M

   b) Discuss the transformation $f(z) = z^2$ maps the families of lines $x =$ constant and $y =$ constant into two families of confocal central conics. 7M

**OR**

10. a) Discuss the transformation $w = \cosh z$ 7M

    b) Find the bilinear transformation which maps the points $z = 0, i, \infty$ onto $w = 1, -i, -1$ 7M

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| Hall Ticket Number : | | | | | | | | | | |
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**R-14**

**Code: 4G341**

II B.Tech. II Semester Supplementary Examinations May 2018

# Random Variables and Random Processes

( Electronics & 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 the following terms
   i) Probability ii) Statistically Independent iii) Bernoulli Trail 6M

   b) A box contains 4 red and 5 white balls. An experiment is to draw two balls from the box without replacement. What is the probability that the first ball is white and second ball is red 8M

**OR**

2. a) Explain the concept of Total probability and Baye's Theorem. 7M

   b) Define the cumulative distribution function and the probability density function, and also write their properties. 7M

**UNIT–II**

3. a) Explain expected value of a random variable and a function of a random variable. 6M

   b) Prove that the variance of exponentially distributed random variable 'X' is $b^2$. 8M

**OR**

4. a) Let X have the exponential density function given by
   $f_X(x) = \begin{cases} \frac{1}{b} e^{-(x-a)/b} & x > a \\ 0 & x < a \end{cases}$ Find variance and the coefficients of skewness. 10M

   b) Write about Gaussian random variable. 4M

**UNIT–III**

5. a) Write about Joint characteristic functions 7M

   b) Show that $E[\sum_{i=1}^{N} \alpha_i X_i] = \sum_{i=1}^{N} \alpha_i E[X_i]$. 7M

**OR**

6. a) State and Prove Central Limit Theorem. 10M

   b) Find a constant $b$ (in terms of $a$) so that the function $f_{X,Y}(x,y) = \begin{cases} be^{-(x+y)} & 0<x<a \text{ and } 0<y<\infty \\ 0 & otherwise \end{cases}$ is a valid joint density function. 4M

**UNIT–IV**

7. a) Explain First-order, second order and wide-sense stationarity. 7M

   b) Define cross correlation function. State and prove its properties. 7M

**OR**

8. a) Discuss Time averages and Ergodicity. 7M

   b) Define covariance functions and justify the statement that the independent processes are uncorrelated but converse is true for joint Gaussian processes. 7M

**UNIT–V**

9. a) Define power spectrum. List out its different properties. 6M

   b) Explain relationship between cross correlation function and cross power spectrum. 8M

**OR**

10. a) Discuss about the bandwidth of Power Density Spectrum 6M

    b) A wide-sense stationary noise process $N(t)$ has an autocorrelation function $R_{NN}(\tau) = Pe^{-3|\tau|}$ where P is constant. Find its power spectrum. 8M

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| Hall Ticket Number : | | | | | | | | | | |
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**R-14**

**Code: 4G342**

II B.Tech. II Semester Supplementary Examinations May 2018

# Switching Theory and Logic Design

( 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) i) Convert $2598.675_{10}$ to Hexadecimal ii) Convert $3A9E.B0D_{16}$ to binary
iii) Covert the octal numbers 256, 2035 to hexadecimal. 6M

b) i) Given the 8 bit data word 10111001, generate the 12 bit hamming code.
ii) Mention the properties of XOR gate. 8M

**OR**

2. a) Obtain the duals of the following functions
i) A'B + A'BC' +A'BCD + A'BC'D'E
ii) X'YZ + X'YZ' + XY'Z' + XY'Z 8M

b) Simplify the following expressions to minimum number of literals
i) x'y + xy + xz' + xy'z'
ii) (A + B)(A' +C)(B' +D)(CD') 6M

## UNIT–II

3. a) i. Implement EX-OR gate using NAND gates
ii. Minimize the expression Y = AB' C + A'B'C + A'BC + AB'C' + A'B'C' using K-map. 6M

b) Minimize the following expressions using K-Map and implement with logic gates.
i) f(P,Q,R,S) = ∑ m(0, 1, 4, 8, 9,10) + d(2, 11)
ii) f(A,B,C,D) = π M(0, 2, 4, 10, 11, 14, 15) 8M

**OR**

4. Simplify the following Boolean expression using Tabular method
F(A,B,C,D) = ∑ m(0, 2, 3, 6, 7, 8, 10, 12, 13) 14M

## UNIT–III

5. a) Draw the truth table and logic diagram of full adder. Implement a 4 bit ripple adder using Full adders. 8M

b) Implement the following logic function using 8 X 1 MUX
F(A,B,C,D) = ∑ m(1, 3, 4, 11, 12, 13, 14, 15) 6M

**OR**

6. a) Design a 4 bit parallel adder with carry look-ahead generator technique. 8M

b) Implement the following two Boolean functions with a PLA
i) F1(A, B, C) = ∑ m(0, 1, 2, 4)
ii) F1(A, B, C) = ∑ m(0, 5, 6, 7) 6M

**UNIT–IV**

7. a) Convert S-R Flip Flop to J-K Flip Flop 6M

   b) What is the difference between synchronous and asynchronous counters? Design a MOD-6 Asynchronous counter using T Flip Flops. 8M

**OR**

8. a) Design a MOD-6 synchronous counter using JK flip flops. 8M

   b) Draw the 4 bit Ring Counter and Johnson Counter using D- Flip-flops and explain the difference between them state diagram. 6M

**UNIT–V**

9. a) Explain the capabilities and limitations of Finite State Machines 6M

   b) Explain the salient features of ASM chart. Draw the state diagram and ASM chart for mod-6 counter. 8M

**OR**

10. a) Differentiate Mealy Machine and Moore Machine. 4M

    b) Find the equivalence partition and a corresponding reduced machine in standard form and also explain the procedure.

| PS | NS, Z | |
|---|---|---|
| | X =0 | X = 1 |
| A | B,0 | E,0 |
| B | E,0 | D,0 |
| C | D,1 | A,0 |
| D | C,1 | E,0 |
| E | B,0 | D,0 |

10M