Hall Ticket Number :										

R-15

Code: 5G344

II B.Tech. II Semester Supplementary Examinations February 2022

Field Theory and Transmission Lines

(Electronics and Communication Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *any five full questions* by choosing one question from each unit (5x14 = 70 Marks)

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Marks

UNIT–I

1. a) State and explain Coulomb's law? Obtain an expression of it in vector form. 7M
   b) Point charges 1mC and -2mC are located at (3, 2, -1) and (-1, -1, 4) respectively. Calculate the electric force on a 10nC charge locate at (0, 3, 1) and the electric field intensity at that point. 7M

OR

2. a) State and Prove Gauss's law and Derive D and E due to infinite line charge. 7M
   b) Define Electric field intensity? Derive Electric field intensity for surface charge. 7M

UNIT–II

3. a) Define current and current density? Differentiate convection and conduction currents. 7M
   b) Discuss the properties of dielectric materials. 7M

OR

4. a) Write a short note on the following i) dielectric constant and dielectric strength ii) Polarization. 7M
   b) Explain the procedure to find the Resistance and capacitance for non-uniform cross section of the conductor. 7M

UNIT–III

5. a) Analogy between Electric and Magnetic field? 7M
   b) Write a short note on the following i) magnetic flux ii) magnetic flux density, iii) Magnetic field intensity or (strength) 7M

OR

6. a) With neat diagram explain Biot Savarts law and write H equations for three current distributions. 7M
   b) Planes z=0 and z=4 carry current K=-10a_x A/m and K-10a_x A/m, respectively Determine H at (i) (1,1,1) (ii) (0,-3,10) 7M

UNIT–IV

7. a) Write a short note on the following i) wave length ii) skin depth iii) propagation constant iv) intrinsic impedance. 7M
   b) Explain the waves in general. 7M

OR

8. a) Derive an expression for reflection coefficient and transmission coefficient when a plane wave is incident normally on an interface between two different media. 7M
   b) In free space ($z \leq 0$), a plane wave with H_i=10 cos(10^8t-βz)a_x mA/m. is incident normally on a lossless medium($\epsilon=2\epsilon_0$, $\mu=8\mu_0$) in region $z \geq 0$). Determine the reflected wave H_r, E_r and the transmitted wave E_t, H_t. 7M

UNIT–V

9. a) Define with mathematical equations of the following : i) characteristic impedance ii) attenuation constant iii) velocity of propagation iv) wave length 7M
   b) Draw and explain about standing waves in OC and SC lines. 7M

OR

10. a) Derive the transmission line equation 7M
    b) Discuss about the Reflection coefficient with relevant expressions. 7M

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Hall Ticket Number :										

R-15

Code: 5G342

II B.Tech. II Semester Supplementary Examinations February 2022

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 High Pass Circuit for Symmetrical Square wave input for different time constants. Also, derive the expression of percentage tilt. 10M

   b) Design a simple attenuator circuit and explain its functionality. 4M

OR

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

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

UNIT–II

3. a) Compare and contrast Linear and Non-Linear wave shaping. 2M

   b) Design any two positive and two Negative Clipper circuits with and without biasing. Also, draw the corresponding input, output waveforms and transfer characteristics. 12M

OR

4. a) Design Transistor as Switch circuit and then verify its functionality. 5M

   b) Design any three different positive and Negative Clamper circuits and then draw the corresponding input and output waveforms. 9M

UNIT–III

5. a) What is a Multivibrator? What are its applications? 4M

   b) Design the Schmitt trigger circuit and then explain the operation of it. Also, derive the expressions for UTP and LTP. 10M

OR

6. a) Define the terms: LTP, UTP, Hysteresis and triggering. 4M

   b) Design an Astable multivibrator circuit and then with the help of the collector and base waveforms explain the principle of operation. Also, derive the expression for its frequency of oscillations. 10M

UNIT–IV

7. a) Describe the operation of a transistor voltage sweep waveform generator, employing a constant current charging method with the help of its circuit diagram and waveforms. 7M

   b) With the help of a neat circuit diagram, explain the working of a transistor current time base generator. 7M

OR

8. a) Draw the circuit of a Boot strap sweep generator and explain its operation. Derive an expression for its sweep time. 8M

   b) Illustrate different methods of generating time base waveform. 6M

UNIT–V

9. a) Compare different logic families in terms of fan-In, fan-out, Propagation delay, noise margin, logic levels and Power dissipation. 6M

   b) Design the four diode bi-directional sampling gate and then explain its operation. Also, give the related expressions. 6M

   c) What is Inhibit operation? 2M

OR

10. a) Compare and contrast the unidirectional sampling gate and bidirectional sampling gate. 3M

    b) Derive expressions for gain and minimum control voltages of a bi-directional two- diode sampling gate. 5M

    c) Design a 2-input TTL NAND gate circuit diagram and then verify its operation with the help of truth table. 6M

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Hall Ticket Number :										

R-15

Code: 5G341

II B.Tech. II Semester Supplementary Examinations February 2022

Random Variables and Random Processes

(Electronics and Communication Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *any five full questions* by choosing one question from each unit (5x14 = 70 Marks)

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		Marks	CO	Blooms Level

UNIT–I

1. a) Discuss the relative frequency approach and axiomatic approach of probability — 7M
   b) Consider the experiment of tossing two dice simultaneously. If X denotes the sum of two faces, find the probability for $X \leq 6$. — 7M

OR

2. a) State and prove Bayes Theorem. — 7M
   b) In a box there are 100 resistors whose resistances and tolerances are as shown in the table below. Let A be the event of drawing a 47Ω resistor, B be the event of drawing a resistor with 5% tolerance, and C be the event of drawing a 100Ω resistor. Find P(A/B), P(A/C) and P(B/C). — 7M

UNIT–II

3. a) Derive expressions for mean and variance for uniform random variable? — 7M
   b) A discrete random variable X takes values from 1 to 5 with probabilities given below

X	1	2	3	4	5
P(X)	0.1	0.2	0.4	0.2	0.1

   Compute the variance and skew of the random variable X — 7M

OR

4. a) Obtain the characteristic function of Poisson random variable — 7M
   b) Find the Moment generating function of a uniform random variable distribute over (A, B) and find its first and second moments about origin, from the Moment generating function — 7M

UNIT–III

5. a) Explain covariance of two random variables. 6M

   b) X and Y are two statistically independent random variables related to W as W= X + Y. Obtain the probability density function of Y in terms of probability density functions of X and Y 8M

OR

6. a) Let X and Y be the random variables defined as X=Cosθ and Y=Sinθ where θ is a uniform random variable over (0, 2π). Are X and Y Uncorrelated/Are X and Y Independent. Analyse in detail. 7M

   b) Prove that the variance of weighted sum of N random variables equals the weighted sum of all their covariances 7M

UNIT–IV

7. a) Classify random processes and explain. 6M

   b) List and explain various properties of Autocorrelation function 8M

OR

8. a) X(t) is a random process with mean =3 and Autocorrelation function Rxx(τ) =10 [exp(- 0.3|τ|)+2]. Find the second central Moment of the random variable Y=X(3)-X(5). 8M

   b) Discuss in detail about: (i) First order stationary random process. (ii) Ergodic process. 6M

UNIT–V

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

   b) Obtain the auto correlation function corresponding to the power density spectrum:

$$S_{XX}(\omega) = \frac{8}{(9 + \omega^2)^2}$$

7M

OR

10. a) Discuss the relationship between cross power spectrum and cross correlation function. 7M

    b) Briefly explain the concept of cross power density spectrum. 7M

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Hall Ticket Number :										

R-15

Code: 5GC41

II B.Tech. II Semester Supplementary Examinations February 2022

Complex Variables & Special Functions

(Common to EEE & ECE)

Max. Marks: 70 Time: 3 Hours

Answer *any five full questions* by choosing one question from each unit (5x14 = 70 Marks)

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UNIT–I

1. a) Symmetry of Beta function B(m, n)=B(n, m) 7M

   b) Evaluate $\int_0^1 \frac{x^2}{\sqrt{1-x^5}}dx$ in terms of B function 7M

OR

2. a) Show that $\Gamma(n)=\int_0^1\left(\log\frac{1}{x}\right)^{n-1}dx \ , n>0$ 7M

   b) Evaluate $\int_0^1 \sqrt{\cot^{-}}\,d^{-}$ 7M

UNIT–II

3. a) Show that $f(z)=z+2\bar{z}$ is not analytic anywhere in the complex plane. 7M

   b) Determine whether the function $2xy+i\left(x^2-y^2\right)$ is analytic. 7M

OR

4. Prove that $\left(\frac{\partial^2}{\partial x^2}+\frac{\partial^2}{\partial y^2}\right)|\mathrm{Re}\,al\ f(z)|^2=2|f'(z)|^2$ where $w=f(z)$ is analytic. 14M

UNIT–III

5. Evaluate $\int_c \frac{\log z}{(z-1)^3}dz$ where $c:|z-1|=\frac{1}{2}$ using Cauchy's integral formula 14M

OR

6. Expand $Log\ z$ by Taylor's series about z=1. 14M

UNIT–IV

7. Find the poles of the function $\frac{z+1}{z^2(z-2)}$ and Residues at the poles 14M

OR

8. a) Find the poles and Residues at each pole $\frac{ze^z}{(z-1)^3}$ 7M

   b) Use Residue theorem to find the number of zeros of the polynomial $z^{10}-6z^7+3z^3+1$ if $|z|<1$ 7M

UNIT–V

9. Show that the image of the hyperbola $x^2-y^2=1$ under the Transformation $w=\frac{1}{z}$ is the Lemniscate $°^2=\cos 2¤$ 14M

OR

10. Show that the function $w=\frac{4}{z}$ transforms the straight line x=c in the z-plane into a circle in the w-plane. 14M

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