Hall Ticket Number :										

R-20

Code: 20A442T

II B.Tech. II Semester Supplementary Examinations December 2023

Communication Systems

(Electronics and Communication Engineering)

Max. Marks: 70 Time: 3 Hours

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Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. In Part-A, each question carries **Two marks.**
3. Answer **ALL** the questions in **Part-A** and **Part-B**

PART-A

(Compulsory question)

		CO	BL
1.	**Answer ALL the following short answer questions** (5 X 2 = 10M)		
a)	What is the need for modulation?	CO1	L2
b)	Define frequency modulation.	CO2	L1
c)	Compare PWM and PPM.	CO3	L4
d)	What is the main idea of Companding?	CO4	L2
e)	Differentiate various Passband data transmission.	CO5	L4

PART-B

Answer *five* questions by choosing one question from each unit (5 x 12 = 60 Marks)

		Marks	CO	BL
	UNIT–I			
2. a)	Explain the generation of AM signals using square law modulator with suitable diagram and expressions.	6M	CO1	L2
b)	Evaluate the percentage of power saving in SSB-SC with respect to AM.	6M	CO1	L3
	OR			
3. a)	Compare AM, DSB-SC and SSB-SC.	6M	CO1	L2
b)	Sketch the circuit diagram of ring modulator and explain how DSB-SC waveform is generated.	6M	CO1	L3
	UNIT–II			
4. a)	Draw the spectral representation of FM wave and derive the expression for total transmission bandwidth.	6M	CO2	L3
b)	Explain the direct method of generation of FM signal using relevant diagrams.	6M	CO2	L2
	OR			
5. a)	Construct a Foster-Seeley discriminator to demodulate a FM signal and explain	6M	CO2	L6

	b)	A 107.6MHz carrier signal is frequency modulated by a 7KHz sine wave. The resultant FM signal has a frequency deviation of 50KHz. Determine the modulation index, the highest and the lowest frequencies attained by the modulated signal.	6M	CO2	L5

UNIT–III

6.	a)	Explain the generation of PAM signals.	6M	CO3	L2
	b)	Demonstrate the demodulation of PWM signal.	6M	CO3	L2

OR

7.	a)	Illustrate how PPM signal can be generated from PWM signal.	6M	CO3	L6
	b)	Compare the merits and demerits of PAM, PWM and PPM signals with applications.	6M	CO3	L2

UNIT–IV

8.	a)	Illustrate the working of delta modulation system with a neat block diagram.	6M	CO4	L2
	b)	Drive an expression for output signal power to Quantization noise in a PCM system.	6M	CO4	L3

OR

9.	a)	Explain the block diagram of digital communication system.	6M	CO4	L2
	b)	The bandwidth of a video signal is 4.5 MHz. This signal is to be transmitted using PCM with the number of quantization levels Q = 1024. The sampling rate should be 20% higher than the Nyquist rate. Calculate the system bit rate.	6M	CO4	L5

UNIT–V

10.	a)	Explain with neat block diagram the generation and recovery of DPSK signals.	6M	CO5	L2
	b)	The bit stream d(t) is to be transmitted using DPSK. If d(t) is 001010011010. Determine b(t) and draw the waveforms.	6M	CO5	L6

OR

11.	a)	Draw and explain the operation of transmitter and receiver of a coherent FSK.	6M	CO5	L2
	b)	Illustrate the BPSK system and discuss its bandwidth requirement.	6M	CO5	L3

*** End ***

Hall Ticket Number :										

R-20

Code: 20A443T

II B.Tech. II Semester Supplementary Examinations December 2023

Electromagnetic Theory

(Electronics and Communication Engineering)

Max. Marks: 70 Time: 3 Hours

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Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. In Part-A, each question carries **Two marks.**
3. Answer **ALL** the questions in **Part-A** and **Part-B**

PART-A

(Compulsory question)

		CO	BL
1.	**Answer ALL the following short answer questions** (5 X 2 = 10M)		
a)	List out the properties of the gradient of a scalar field.	CO1	L4
b)	Define Coulomb's law of force.	CO2	L1
c)	Discuss Polarization in dielectrics.	CO3	L2
d)	Illustrate Maxwell's equations for static EM fields.	CO4	L3
e)	Determine the characteristic impedance of a transmission Line with impedance and admittance of 16 and 9 respectively.	CO5	L3

PART-B

Answer *five* questions by choosing one question from each unit (5 x 12 = 60 Marks)

		Marks	CO	BL
	UNIT–I			
2. a)	Express $\mathbf{A} = \rho z \sin\emptyset\, \mathbf{a}_\rho + 3\rho \cos\emptyset\, \mathbf{a}_\emptyset + \rho \cos\emptyset \sin\emptyset\, \mathbf{a}_z$ in spherical co-ordinates.	6M	CO1	L1
b)	Calculate differential length, differential surface, and differential volume for all three coordinate systems.	6M	CO1	L3
	OR			
3. a)	Express the following points P(1,60^o,2), Q (4, π/2, π/6) in cartesian co-ordinates.	6M	CO1	L1
b)	Find the gradient of the given scalars. i) $V = 4xz^2 + 3yz$. ii) $W = 2\rho(z^2+1)\cos\emptyset$.	6M	CO1	L3
	UNIT–II			
4. a)	State Gauss's law. Derive the expression for Electric Field intensity due to an infinite sheet of charge using Gauss's law.	6M	CO2	L2
b)	A Charge of -0.3 μC is located at A(25, -30, 15) (in cm) and a second charge of 0.5 μC is at B(-10, 8, 12) cm. Find Electric field intensity at (i) the origin (ii) P(15, 20, 50) cm.	6M	CO2	L3

OR

5. a) Point charges 5 nC and -2 nC are located at (2, 0, 4) and (-3, 0, 5), respectively. Determine the force on a 1 nC point charge located at (1, -3, 7). 6M CO2 L3

   b) Derive the relationship between electric field intensity and electric potential. 6M CO2 L6

UNIT–III

6. a) Moist soil has a conductivity of 10^{-3} siemens/m and $\varepsilon_r = 2.5$. Evaluate J_c and J_d where **E =** $6 \times 10^{-6} \sin(9 \times 10^9 t)$ V/m. 6M CO3 L5

   b) Derive Poisson's and Laplace's equations starting from Gauss's law? 6M CO3 L6

OR

7. a) In free space, $V=x^2y(z+3)$ V. Find **E** at (3, 4, -6). 6M CO3 L3

   b) A spherical capacitor with a = 1.5cm, b = 4cm has an inhomogeneous dielectric of $\varepsilon = 10\varepsilon_0$. Calculate the capacitance of the capacitor. 6M CO3 L3

UNIT–IV

8. a) Write about Ampere's circuit law and calculate current density at (2, -1, 3) due to magnetic field intensity of $\mathbf{H}= xy^2\mathbf{a_x}+x^2z\mathbf{a_y}-y^2z\,\mathbf{a_z}$ A/m. 6M CO4 L2

   b) Derive an expression for magnetic field strength **H** due to a current carrying conductor of finite length using Biot - Savart's law. 6M CO4 L6

OR

9. a) Given the magnetic vector potential $\mathbf{A} = -\rho^2/4\ \mathbf{a}_z$ wb/m. Calculate the total magnetic flux passing the surface if $\phi = \pi/2$, $1 \le \rho \le 2$ m, $0 \le z \le 5$ m. 6M CO4 L3

   b) Derive the expression for the energy stored in magnetostatic fields. 6M CO4 L6

UNIT–V

10. a) Develop the voltage and current equations for transmission lines. 6M CO5 L6

    b) Describe the configuration and applications of smith chart. 6M CO5 L2

OR

11. a) State and prove the Poynting theorem. 6M CO5 L1

    b) A uniform plane wave at a frequency of 1 GHz is travelling in a large block of Teflon ($\varepsilon_r = 2.1$, $\mu_r = 1$ and $\sigma = 0$). Determine γ, β, η and λ. 6M CO5 L3

*** End ***

Hall Ticket Number :										

R-20

Code: 20A441T

II B.Tech. II Semester Supplementary Examinations December 2023

Linear IC Applications

(Electronics and Communication Engineering)

Max. Marks: 70 Time: 3 Hours

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Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. In Part-A, each question carries **Two marks.**
3. Answer **ALL** the questions in **Part-A** and **Part-B**

PART-A

(Compulsory question)

1. Answer ALL the following short answer questions (5 X 2 = 10M) CO BL

a) Mention the characteristics of an ideal op-amp. CO1 L2

b) What are the applications of V-I and I-V converters? CO2 L3

c) What are the applications of integrator and differentiator? CO3 L3

d) Define capture range and lock range in PLL. CO4 L1

e) What are the different techniques for DAC? CO5 L4

PART-B

Answer *five* questions by choosing one question from each unit (5 x 12 = 60 Marks)

Marks CO BL

UNIT–I

2. a) Write short notes on classification of IC. 6M CO1 L2

b) Draw the schematic block diagram of the basic Op-amp. Explain the significance of virtual ground in basic inverting op-amp. How would you explain its existence? 6M CO1 L4

OR

3. Analyze various DC and AC characteristics of an op-amp. 12M CO1 L4

UNIT–II

4. a) Explain the three basic op-amp configurations. 6M CO2 L2

b) Draw the circuit diagram of an op-amp differentiator and derive an expression for the output in terms of the input. 6M CO2 L5

OR

5. a) Draw the circuit diagram of instrumentation amplifier using 741 op - amp and explain its operation. 6M CO2 L4

b) An op-amp is being used as voltage-to-current converter. The value of resistance used in the circuit R is 6.8 kΩ, R_L = 2 kΩ, V_1= 5 V, V_2= 0 V. Determine the values of I_L, V_L and V_o. Draw the circuit. 6M CO2 L5

UNIT–III

6.	a)	Draw the circuit diagram of astable multivibrator using op-amp and explain its operation with relevant sketches.	6M	CO3	L4
	b)	Draw the circuit of saw tooth wave generator and explain its working.	6M	CO3	L2

OR

7.	a)	With the help of neat circuit diagram explain the working of a logarithmic amplifier,	6M	CO3	L3
	b)	What is precision rectifier? Explain the principle of operation of a precision half wave rectifier with waveforms.	6M	CO3	L4

UNIT–IV

8.	a)	Draw the functional diagram of 555 timer and discuss its operation.	6M	CO4	L2
	b)	Explain the operation of an astable multivibrator using 555 timer. Derive the expression for on and off state time periods.	6M	CO4	L5

OR

9.	a)	Explain the operation of a Schmitt trigger using IC 555.	6M	CO4	L2
	b)	Draw the block diagram of generation of FSK using a PLL. Explain its function.	6M	CO4	L5

UNIT–V

10.	a)	Define and analyze briefly the following terms of D/A converters: (i) Resolution (ii) settling time (iii) conversion time	6M	CO5	L4
	b)	With a neat diagram explain the working principle of R-2R ladder type DAC. Derive the expression for its output voltage.	6M	CO5	L5

OR

11.	a)	Why successive approximation ADC is faster than dual slope ADC? Explain.	6M	CO5	L4
	b)	Explain the operation of dual slope ADC.	6M	CO5	L3

*** End ***

Hall Ticket Number :										

R-20

Code: 20AC42T

II B.Tech. II Semester Supplementary Examinations December 2023

Numerical Methods and Random Variables

(Common to EEE and ECE)

Max. Marks: 70 Time: 3 Hours

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Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. In Part-A, each question carries **Two marks.**
3. Answer **ALL** the questions in **Part-A** and **Part-B**

PART-A

(Compulsory question)

1. Answer ALL the following short answer questions (5 X 2 = 10M) CO BL

a) Explain Bisection method to find the real root of the equation f(x)=0. CO1 L1

b) Consider the differential equation $\frac{dy}{dx} = f(x,y), y(x_0) = y_0$. Explain Taylor's series method for finding the approximate solution *y(x).* CO2 L1

c) Find the mean, median, and mode of the following data. 8, 12, 10, 11, 13, 12, 15, 9, 11, 16. CO3 L2

d) Write a short note on Continuous Probability distribution function. CO4 L1

e) If the probability of a defective bolt is 0.1, find
(i) the mean (ii) the standard deviation of the Binomial distribution in a total of 400 bolts. CO5 L2

PART-B

Answer *five* questions by choosing one question from each unit (5 x 12 = 60 Marks)

Marks CO BL

UNIT–I

2. a) Apply Newton-Raphson's method to find the real root of the equation $x\log_{10} x - 1.2 = 0$ by taking suitable initial approximation. 6M CO1 L3

b) From the following table of yearly premiums for policies maturing at quinquennial ages, estimate the premiums for policies maturing at the age of 46 years.

Age (x):	45	50	55	60	65
Premium (y):	2.87	2.40	2.08	1.86	1.71

6M CO1 L4

OR

3. a) Apply Regula falsi method to find the root of the equation $\cos x = xe^x$ correct to three decimal places. 6M CO1 L3

b) Interpolate the value of the function *y=f(x)* corresponding to x=1 using Lagrange's interpolation formula from the following set of data:

x	0	3	4
y=f(x)	12	6	8

6M CO1 L4

UNIT–II

4. a) Find the first and second order derivatives of the function tabulated below at the point x=10.

x	2	4	6	8	10
y	5.5	6.1	7.2	15.3	16

6M CO2 L4

Evaluate the integral $\int_0^6 \frac{dx}{1+x^2}$ by taking 7 ordinates (i.e. six sub intervals) using i) Trapezoidal rule and ii) Simpson's 3/8th rule.

6M CO2 L4

b)

OR

5. Apply Euler's method to find the approximate value of y for x = 1, in step of *h=0.1*, given that $\frac{dy}{dx} = \frac{y-x}{y+x}$, with y=1 for x=0. 12M CO2 L4

UNIT–III

6. a) Calculate Mean, Median, Mode from the following grouped data:

x	0	1	2	3	4
Frequency (*f*)	1	5	10	6	3

6M CO3 L5

b) Make use of correlation coefficient formula to find the correlation coefficient between the ages of husbands (x) and wives (y) from the following data.

x	23	25	26	28	29	30	31	33	35	36
y	18	20	22	27	21	29	27	29	28	29

6M CO3 L5

OR

7. Compute the rank correlation coefficient for the following data of the marks obtained by 8 students in the Physics (x) and Mathematics (y).

Marks in Physics (x)	15	20	28	12	40	60	20	80
Marks in Mathematics (y)	40	30	50	30	20	10	30	60

12M CO3 L5

UNIT–IV

8. a) A husband and wife appear in an interview for two vacancies in the same post. The probability of husband's selection is 1/7 and that of wife's selection is 1/5. What is the probability that (i) both of them will be selected? (ii) Only one of them will be selected and (iii) none of them will be selected? 6M CO4 L3

b) Three urns contain 6 red, 4 black; 4 red, 6 black; 5 red, 5 black balls respectively. One of the urns is selected at random and a ball is drawn from it. If the ball drawn is red find the probability that it is drawn from the first urn. 6M CO4 L3

OR

9. In the following probability distribution

x	0	1	2	3	4	5	6
p(x)	k	2k	3k	4k	5k	6k	7k

Find i) the value of 'k' ii) P(x<5), P(x>=5), P(0<x<4) iii) mean and iv) Variance of the distribution. 12M CO4 L3

UNIT–V

10. a) If 10% of bolts produced by a machine are defective. Determine the probability that out of 10 bolts, chosen at random (i) one (ii) none (iii) at most 2 bolts will be defective. 6M CO5 L6

b) The distribution of typing mistakes committed by a typist is given below. Fit Poisson distribution, and compare the theoretical frequencies with actual ones.

x	0	1	2	3	4	5
f	142	156	69	27	5	1

6M CO5 L6

OR

11. Assuming that the average life span of computers produced by a certain company is 2040 hours with standard deviation of 60 hours. Find the expected number of computers whose life span is
    (a) more than 2150 hours
    (b) less than 1950 hours
    (c) more than 1920 hours and less than 2160 hours from a lot size of 5000 computers. 12M CO5 L6

*** End ***

Hall Ticket Number :										

R-20

Code: 20A444T

II B.Tech. II Semester Supplementary Examinations December 2023

Advanced Digital Design Concepts

(Electronics and Communication Engineering)

Max. Marks: 70 Time: 3 Hours

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Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. In Part-A, each question carries **Two marks.**
3. Answer **ALL** the questions in **Part-A** and **Part-B**

PART-A

(Compulsory question)

1. Answer ALL the following short answer questions (5 X 2 = 10M) CO BL

a) Explain the basic structure of a CMOS logic gate and how it functions. 1 L2

b) Explain the purpose of HDL in digital circuit design. 2 L2

c) Provide an example of a conditional signal assignment statement in data flow design. 3 L3

d) What is the purpose of a decoder in digital circuits 4 L1

e) Give an example of a shift register and explain its role in digital circuit design 5 L3

PART-B

Answer *five* questions by choosing one question from each unit (5 x 12 = 60 Marks)

Marks CO BL

UNIT–I

2. a) Compare and contrast the steady-state electrical behavior of CMOS logic and TTL logic. Discuss their power consumption, noise immunity, and voltage range. 6M 1 L4

b) Design an Emitter-Coupled Logic (ECL) circuit for NOR gate. Provide the schematic diagram, explain its operation 6M 1 L6

OR

3. a) Critically analyze the advantages and disadvantages of CMOS/TTL interfacing techniques. Discuss the challenges and potential issues when connecting CMOS and TTL logic devices. 6M 1 L4

b) Assess the advantages and disadvantages of Low Voltage CMOS logic. Discuss how it addresses power consumption and noise issues in digital circuits. 6M 1 L5

UNIT–II

4. Evaluate the impact of using HDL in the design of complex digital systems. Discuss the advantages and challenges of HDL in terms of design abstraction, simulation, synthesis, and code reuse. Provide real-world examples to support your analysis. 12M 2 L5

OR

5.	a)	Analyze the significance of component declaration and component instantiation in HDL structural design. Discuss how these elements contribute to modularity, reusability, and hierarchical design.	6M	2	L4
	b)	Explain the purpose of packages and libraries in HDL. How do they facilitate code organization, reusability, and design optimization	6M	2	L2

UNIT–III

6.	a)	Explain the role and significance of entity declaration in behavioral design. How does it define the interface and internal structure of a digital system?	6M	3	L2
	b)	Analyze the purpose and functionality of the wait statement in behavioral design. How does it control the execution and synchronization of processes in a digital system?	6M	3	L4

OR

7.	a)	Describe the purpose and functionality of the null statement in behavioral design. Provide an example scenario where it is commonly used.	4M	3	L3
	b)	Analyze the components and structure of an architecture body in behavioral design. Discuss its role in defining the behavior and operation of a digital system.	8M	3	L4

UNIT–IV

8.	a)	Explain the purpose and operation of an ALU (Arithmetic Logic Unit) in digital circuits.	4M	4	L2
	b)	Analyze the design and functionality of a barrel shifter. Explain its operation and discuss its applications in digital circuits.	8M	4	L4

OR

9.		Design a digital circuit for an n-bit ones counter using VHDL. Include the necessary components, describe the circuit's functionality, and provide a detailed VHDL model.	12M	4	L6

UNIT–V

10.	a)	Analyze the design and implementation of a synchronous counter using VHDL.	8M	5	L4
	b)	Design T-Flip Flop using D-Flip Flop	4M	5	L2

OR

11.		Analyze the different types of counters (e.g., up counter, down counter, binary counter) and discuss their VHDL modeling considerations.	12M	5	L4

*** End ***