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| <b>R-20</b> |
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**Code: 20A443T**

II B.Tech. II Semester Regular & Supplementary Examinations May / June 2024

**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)

- |   |    |    |
|---|----|----|
| 1. Answer ALL the following short answer questions ( 5 X 2 = 10M )  | CO | BL |
| a) Transform the Cartesian co-ordinates x=2, y=1 and z=3 into spherical coordinates   | 1  | 2  |
| b) Find the electric potential V at a point (4, 1, 3)m due to a charge of 10·µC located at the origin in free space   | 2  | 1  |
| c) A parallel plate capacitor with d=1m and plate area 0.8 m <sup>2</sup> and a dielectric relative permittivity of 2.8. A DC volt of 500V is applied between the plates. Find the capacitance and energy stored. | 2  | 2  |
| d) State Ampere's circuit law.  | 2  | 1  |
| e) Write down Maxwell's equations derived from Faraday's law.   | 3  | 2  |

**PART-B**

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

Marks CO BL

**UNIT-I**

- |   |    |   |   |
|---|----|---|---|
| 2. a) State and prove divergence theorem? | 6M | 1 | 1 |
| b) State Stokes Theorem                   | 6M | 1 | 2 |

**OR**

- |  |    |   |   |
|--|----|---|---|
| 3. a) Express the vector B in Cartesian and cylindrical systems. Given $B = \frac{1}{r} a_r + r \cos \theta a_\theta$ , then find B at (-3,4,0) and $(5, \frac{\pi}{2}, -2)$ | 7M | 1 | 1 |
| b) Write down the expressions for gradient, divergence and curl in three co-ordinate systems.  | 5M | 1 | 2 |

**UNIT-II**

- |  |    |   |   |
|--|----|---|---|
| 4. a) Explain the Gauss's Law and its applications                                       | 6M | 2 | 1 |
| b) Derive the Energy density expression for the three charges present in the free space. | 6M | 2 | 2 |

**OR**

5. a) Derive the expression of E for infinite line charge conductor present in the z axis. 6M 2 3
- b) Derive the expression of E for infinite surface charge located in the z=0 plane. 6M 2 2

**UNIT-III**

6. a) Explain linear, Isotropic and homogeneous dielectric materials. 7M 2 1
- b) Derive and explain the Poisson and Laplace Equations. 5M 2 2

**OR**

7. a) Derive the continuity equation for the time varying fields 7M 2 2
- b) Derive and explain the Relaxation Time 5M 2 3

**UNIT-IV**

8. a) Derive the expression for the H due to infinite length of conductor using Biot savart Law 6M 2 1
- b) State and derive any one application of Amperes circuital Law. 6M 2 2

**OR**

9. a) Derive the Maxwell equation from the Faraday's Law. 6M 2 2
- b) Write the difference between Magnetic scalar and Vector potentials. 6M 2 1

**UNIT-V**

10. a) Derive Pointing theorem and state its significance. 5M 3 1
- b) Write a short notes on
- i) plane waves in lossless dielectrics
  - ii) plane waves in free space
  - iii) Plane waves in good Conductors
  - iv) Wave propagation in Lossy Dielectrics 7M 3 2

**OR**

11. Derive and explain the reflection coefficient for perfect Dielectric at normal Incidence. 12M 3 2

\*\*\* End \*\*\*

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| <b>R-20</b> |
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**Code: 20A441T**

II B.Tech. II Semester Regular & Supplementary Examinations May/June 2024

**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 <b>ALL</b> the following short answer questions ( 5 X 2 = 10M ) | CO  | BL |
| a) Classify the integrated circuits                                       | CO1 | L4 |
| b) Sketch the op-amp inverting circuit                                    | CO2 | L1 |
| c) List the applications of comparator                                    | CO3 | L1 |
| d) Define PLL   | CO4 | L1 |
| e) Tabulate the advantage of successive approximation method              | CO5 | L1 |

**PART-B**

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

- |   | Marks | CO  | BL |
|---|-------|-----|----|
| <b>UNIT-I</b>   |       |     |    |
| 2. a) List the advantages and disadvantages of ICs              | 4M    | CO1 | L1 |
| b) Explain different ideal op amp characteristics               | 8M    | CO1 | L2 |
| <b>OR</b>   |       |     |    |
| 3. a) Discuss open loop and closed loop circuits                | 4M    | CO1 | L2 |
| b) Explain the DC characteristics of op-amp                     | 8M    | CO1 | L2 |
| <b>UNIT-II</b>  |       |     |    |
| 4. a) Design summing amplifier with 3 inputs                    | 6M    | CO2 | L6 |
| b) Illustrate the op-amp used as differentiator circuit         | 6M    | CO2 | L4 |
| <b>OR</b>   |       |     |    |
| 5. Analyze V-I and I-V converter using op-amp                   | 12M   | CO2 | L4 |
| <b>UNIT-III</b>   |       |     |    |
| 6. a) Demonstrate comparator circuit                            | 8M    | CO3 | L3 |
| b) Discuss different states in multivibrators                   | 4M    | CO3 | L2 |
| <b>OR</b>   |       |     |    |
| 7. a) Describe triangular wave form generator                   | 8M    | CO3 | L2 |
| b) Show the simple rectifier circuit using op-amp               | 4M    | CO3 | L3 |
| <b>UNIT-IV</b>  |       |     |    |
| 8. a) Draw and explain internal structural diagram of 555 timer | 8M    | CO4 | L2 |
| b) List different application of 555 timer                      | 4M    | CO4 | L1 |
| <b>OR</b>   |       |     |    |
| 9. a) Describe the principle of PLL                             | 4M    | CO4 | L2 |
| b) Demonstrate frequency multiplication circuit using PLL       | 8M    | CO4 | L3 |
| <b>UNIT-V</b>   |       |     |    |
| 10. a) List the advantages of R-2R ladder network               | 4M    | CO5 | L1 |
| b) Explain binary weighted resistor DAC                         | 8M    | CO5 | L2 |
| <b>OR</b>   |       |     |    |
| 11. With necessary diagram explain dual slope ADC               | 12M   | CO5 | L2 |

\*\*\*END\*\*\*

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**Code: 20AC42T**

II B.Tech. II Semester Regular & Supplementary Examinations May/June 2024

**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) Write Regula falsi method formula. CO1 L5
- b) Evaluate  $\int_0^{0.6} e^x dx$ , by Simpson's  $\frac{1}{3}$  rule, taking n=6. CO2 L5
- c) Write the Properties of rank correlation coefficient. CO3 L6
- d) What is the probability for a leap year to have 52 Mondays and 53 Sundays? CO4 L1
- e) A fair coin is tossed six times. Find the probability of getting four heads. CO5 L1

**PART-B**

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

Marks CO BL

|               |
|---------------|
| <b>UNIT-I</b> |
|---------------|

2. a) Determine the root of  $xe^x = 2$  by method of false position. 6M CO1 L3
- b) Applying Newton's backward interpolation find  $f(1.38)$  from the following table.

|      |       |       |       |        |
|------|-------|-------|-------|--------|
| x    | 1.1   | 1.2   | 1.3   | 1.4    |
| f(x) | 7.831 | 8.728 | 9.627 | 10.744 |

6M CO1 L3

**OR**

3. a) Find a real root of equation  $x^3 - x - 11 = 0$  by bisection method. 6M CO1 L1
- b) Compute the value of y, when x=3 by using Lagrange's interpolation formula.

|   |    |    |   |    |
|---|----|----|---|----|
| x | -2 | -1 | 1 | 2  |
| y | -7 | 2  | 0 | 11 |

6M CO1 L3

|                |
|----------------|
| <b>UNIT-II</b> |
|----------------|

4. a) Find the first and second derivatives of the function tabulated below at the point x=1.2

|   |        |        |        |        |        |        |        |
|---|--------|--------|--------|--------|--------|--------|--------|
| x | 1.0    | 1.2    | 1.4    | 1.6    | 1.8    | 2.0    | 2.2    |
| y | 2.7183 | 3.3201 | 4.0552 | 4.9530 | 6.0496 | 7.3891 | 9.0250 |

6M CO2 L1

- b) Evaluate  $\int_0^2 e^{-x^2} dx$  using Simpson's rule taking h = 0.25. 6M CO2 L5

**OR**

5. Obtain  $y(0.02)$ ,  $y(0.04)$  for  $y' = y + x^2$ ,  $y(0) = 1$  Using modified Euler's method. 12M CO2 L3

**UNIT-III**

6. Calculate the mean, median and mode for the following:

|           |    |    |    |    |    |    |    |    |    |
|-----------|----|----|----|----|----|----|----|----|----|
| Mid Value | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 |
| Frequency | 2  | 22 | 19 | 14 | 3  | 4  | 6  | 1  | 1  |

12M CO3 L3

**OR**

7. Find the rank correlation coefficient for the following data

|   |    |    |    |    |    |    |    |    |    |    |
|---|----|----|----|----|----|----|----|----|----|----|
| x | 68 | 64 | 75 | 50 | 64 | 80 | 75 | 40 | 55 | 64 |
| y | 62 | 58 | 68 | 45 | 81 | 60 | 68 | 48 | 50 | 70 |

12M CO3 L1

**UNIT-IV**

8. a) Two marbles are drawn in succession from a box containing 10 red, 30 white, 20 blue and 15 orange marbles, with replacement being made after each draw. Find the probability that (i) Both are white (ii) First is red and second is white. 6M CO4 L1
- b) In a bolt factory machines A, B, C manufacture 20%, 30% and 50% of the total of their output 6%, 3% and 2% are defective. A bolt is drawn at random and found to be defective. Find the probabilities that it is manufactured from (i) Machine A (ii) Machine B (iii) Machine C. 6M CO4 L1

**OR**

9. The frequency function of a continuous random variable X is given by  $f(x) = cx(2-x)$ ,  $0 \leq x \leq 2$ . Find the value of c, mean and variance of X. 12M CO4 L5

**UNIT-V**

10. a) 20% of items produced from a factory are defective. Find the probability that in a sample of 5 chosen at random (i) none is defective (ii) one is defective (iii)  $p(1 < x < 4)$  6M CO5 L1
- b) The average number of phone calls/ minute coming into a switch board between 2 pm and 4 pm is 2.5. Determine the probability that during one particular minute there will be (i) 4 or fewer (ii) more than 6 calls. 6M CO5 L1

**OR**

11. The marks obtained in mathematics by 1000 students is normally distributed with mean 78% and standard deviation 11%. Determine (i) How many students got marks above 90% (ii) What was the highest mark obtained by the lowest 10% of the students (iii) Within what limits did the middle of 90% of the students lie. 12M CO5 L1

\*\*\* End \*\*\*

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**Code: 20A444T**

II B.Tech. II Semester Regular & Supplementary Examinations May/June 2024

**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 <b>ALL</b> the following short answer questions ( 5 X 2 = 10M )         | CO | BL |
| a) How many transistors are used in a CMOS Inverter?                              | 1  | L1 |
| b) What is a Data object  | 2  | L1 |
| c) Identify the role and significance of entity declaration in behavioral design. | 3  | L2 |
| d) What is a Barrel shift register?   | 4  | L1 |
| e) Differentiate between synchronous and asynchronous sequential circuits.        | 5  | 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) Explain about CMOS dynamic electrical behaviour. | 6M | 1 | L2 |
| b) Discuss about CMOS/TTL interfacing.                 | 6M | 1 | L2 |

**OR**

- |   |    |   |    |
|---|----|---|----|
| 3. a) Tabulate the differences between various logic families.                    | 6M | 1 | L2 |
| b) With the help of a neat circuit diagram, explain the 2-input LS-TTL NAND gate. | 6M | 1 | L2 |

**UNIT-II**

- |  |    |   |    |
|--|----|---|----|
| 4. a) Evaluate the role of various functions and procedures available in VHDL. | 6M | 2 | L5 |
| b) Briefly discuss about Structural design elements.                           | 6M | 2 | L2 |
| <b>OR</b>  |    |   |    |
| 5. a) Write about the Data types in VHDL.                                      | 6M | 2 | L2 |
| b) Design a Full adder using component declaration in VHDL.                    | 6M | 2 | L6 |

**UNIT-III**

6. a) Distinguish between variable and Signal assignment statements in VHDL. 6M 3 L4  
 b) Design 3 to 8 decoder using case statement in VHDL. 6M 3 L6

**OR**

7. a) Distinguish between concurrent and sequential signal assignment statements in VHDL. 6M 3 L4  
 b) Explain about the behavioral flow model with an example. 6M 3 L2

**UNIT-IV**

8. a) Design binary to Gray code converter using VHDL. 6M 4 L6  
 b) Explain about barrel shifter with neat diagram? 6M 4 L2

**OR**

9. a) Design 8X1 Mux using 4x1 Mux. 6M 4 L6  
 b) Explain about 3-bit Ripple carry adder with neat sketches. 6M 4 L2

**UNIT-V**

10. a) What is Counter? Design a Counter using VHDL. 6M 5 L6  
 b) Analyze the design and implementation of a synchronous counter using VHDL. 6M 5 L4

**OR**

11. a) Discuss about Synchronous design methodology? 6M 5 L2  
 b) Describe the T Flip-Flop with its logic diagram. 6M 5 L2

\*\*\* End \*\*\*

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**Code: 20A442T**

II B.Tech. II Semester Regular & Supplementary Examinations May / June 2024

**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)

- |   |     |    |
|---|-----|----|
| <b>1. Answer ALL the following short answer questions ( 5 X 2 = 10M )</b> | CO  | BL |
| a) What is the advantages of SSB-SC modulation over AM?                   | CO1 | L1 |
| b) Differentiate between phase modulation and frequency modulation.       | CO2 | L2 |
| c) What is time division multiplexing?                                    | CO3 | L1 |
| d) What is quantization?  | CO4 | L1 |
| e) Write the advantages of FSK.   | CO5 | L1 |

**PART-B**

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

Marks    CO    BL

**UNIT-I**

- |  |     |     |    |
|--|-----|-----|----|
| 2. Show that any scheme that can demodulate DSB-SC can also demodulate AM. Its converse also true? | 12M | CO1 | L4 |
|--|-----|-----|----|

**OR**

- |   |     |     |    |
|---|-----|-----|----|
| 3. Suppose nonlinear devices are available for which the output current $i_0$ and input voltage $v_i$ are related by<br>$i_0 = a v_i + b v_i^2$ where a and b are constant. Explain how these devices may be used to produce the square law modulation. | 12M | CO1 | L4 |
|---|-----|-----|----|

**UNIT-II**

- |  |     |     |    |
|--|-----|-----|----|
| 4. An angle modulated signal with carrier frequency $\omega_c = 2\pi \times 10^6$ rad/sec is given by<br>$s(t) = 10 \cos(\omega_c t + 0.1 \sin 2000\pi t)$ (i) Find the power of the modulated signal<br>(ii) Find the frequency deviation<br>(iii) Find the phase deviation | 12M | CO2 | L4 |
|--|-----|-----|----|

**OR**



5. Justify the statement 'FM has infinite bands'. Calculate the bandwidth of an FM signal generated to have a deviation of 75KHz by a message signal of 9 KHz. What is the modulation index of the FM wave? 12M CO2 L5

**UNIT-III**

6. a) Explain with diagram how to obtain PAM signals for baseband transmission for a single information channel, carrying voice frequencies upto 3.3kHz using a sampling rate of 8 kHz. Determine the bandwidth required. 6M CO3 L2
- b) Compare Time Division Multiplexing and Frequency Division Multiplexing. 6M CO3 L2

**OR**

7. a) What is pulse width modulation? Write its applications. Define duty cycle. 6M CO3 L1
- b) Compare PAM, PPM and PWM. 6M CO3 L2

**UNIT-IV**

8. a) Briefly explain PCM system suitable for transmission of speech. 6M CO4 L2
- b) Compare digital and analog communication system. 6M CO4 L2

**OR**

9. a) Establish a relation between signal to noise ratio and transmission bandwidth in a PCM system. 6M CO4 L3
- b) Explain adaptive delta modulator with reference to a delta modulator. 6M CO4 L2

**UNIT-V**

10. a) Discuss the means of generating a DPSK signal. 6M CO5 L1
- b) Establish a comparative study between digital modulation techniques Phase Shift Keying and Frequency shift Keying 6M CO5 L3

**OR**

11. Explain BPSK transmitter and receiver with the help of block diagram, waveforms and phasor diagram. 12M CO5 L2

\*\*\* End \*\*\*