| Hall Ticket Number : | | | | | | | | | | |
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**R-20**

**Code: 20A234T**

II B.Tech. I Semester Regular Examinations March 2022

# Switching Theory and Logic Design

( Electrical and Electronics 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 mark.**
3. Answer **ALL** the questions in **Part-A** and **Part-B**

## PART-A

**(Compulsory question)**

| | | | Blooms Level |
|---|---|---|---|
| 1. | Answer ***all*** the following short answer questions ( 5 X 2 = 10M ) | CO | |
| a) | Represent +25 and -25 in sign-2's complement representation. | CO1 | L1 |
| b) | State Demorgan's theorems for three variables | CO2 | L1 |
| c) | Implement full adder using two half adders. | CO3 | L3 |
| d) | Compare synchronous and asynchronous sequential circuits | CO4 | L2 |
| e) | What are the salient features of ASM chart? | CO5 | L1 |

## PART-B

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

| | | | Marks | CO | Blooms Level |
|---|---|---|---|---|---|
| | | **UNIT–I** | | | |
| 2. | a) | Convert the following numbers:<br>(i) $(4567)_8$ to base 10.<br>(ii) $(11001101.0101)_2$ to base 8 and base 4.<br>(iii) $(53.1575)_{10}$ to base 2. | 6M | CO1 | L2 |
| | b) | Explain error correction and error detection codes with examples? | 6M | CO1 | L2 |
| | | **OR** | | | |
| 3. | a) | What are universal gates? Realize AND, OR, NOT, XOR gates using universal gates. | 6M | CO1 | L2 |
| | b) | Prove that OR-AND network is equivalent to NOR-NOR network. | 6M | CO1 | L2 |
| | | **UNIT–II** | | | |
| 4. | a) | Simplify the following Boolean function for minimal SOP form using K-map F (W, X, Y, Z) = Σm (0, 1, 2, 3, 4, 6, 8, 9, 10, 11) | 6M | CO2 | L3 |
| | b) | What is K-map? State advantages and limitations of K-map? | 6M | CO2 | L1 |
| | | **OR** | | | |
| 5. | | Minimize the function using k-map and obtain minimal SOP function?<br>F (A,B,C,D) = Σm (1,2,3,4,6,9,10,12,14) + **d** (5,7,11). | 12M | CO2 | L3 |

**UNIT–III**

| | | | | | |
|---|---|---|---|---|---|
| 6. | a) | Design 2x4 decoder using NAND gates. | 6M | CO3 | L4 |
| | b) | Elucidate 4 bit parallel adder with an example | 6M | CO3 | L5 |

**OR**

| | | | | | |
|---|---|---|---|---|---|
| 7. | a) | Implement the following Boolean functions using PROM F1= Σm(0,1,2,4,6,7) F2= Σm(0,1,2,4,6). | 8M | CO3 | L3 |
| | b) | Compare between PLA, PAL and ROM | 4M | CO3 | L3 |

**UNIT–IV**

| | | | | | |
|---|---|---|---|---|---|
| 8. | a) | Draw the logic symbols and truth tables of JK and T flip flop | 6M | CO4 | L4 |
| | b) | Explain the operation of twisted ring counter with the help of logic diagram and its timing diagrams. | 6M | CO4 | L2 |

**OR**

| | | | | | |
|---|---|---|---|---|---|
| 9. | a) | Design a Mod -6 synchronous counter using JK Flip-Flop? | 6M | COR | L4 |
| | b) | Draw the logic diagram of a 4 bit shift counter using positive edge triggering. | 6M | CO4 | L1 |

**UNIT–V**

| | | | | | |
|---|---|---|---|---|---|
| 10. | a) | Compare between Moore and Mealy machine. | 6M | CO5 | L2 |
| | b) | List the capabilities and limitations of finite state machines. | 6M | CO5 | L1 |

**OR**

11. a) What are the conditions for the two machines are to be equivalent? For the machine given below, find the equivalence partition and a corresponding reduced machine in standard form.

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

8M CO5 L4

b) Explain the symbols used in an ASM chart with neat diagrams. 4M CO5 L2

*** End ***

| Hall Ticket Number : | | | | | | | | | | |
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**R-20**

**Code: 20AC32T**

II B.Tech. I Semester Regular Examinations March 2022

# Transform Techniques & Complex Variables

( Common to EEE and ECE )

Max. Marks: 70 Time: 3 Hours

*********

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. In Part-A, each question carries **Two mark.**
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 | Blooms Level

a) Find $L[\sin 3t \cos 2t]$ — CO1 — L4

b) Evaluate: $L^{-1}\left[\frac{1}{s(s+2)}\right]$ — CO2 — L3

c) Find the Fourier coefficient $a_n$ of the Fourier series expansion for the function $f(x) = x^2$ in the interval $[0, 2\pi]$. — CO3 — L1

d) Evaluate $\int_C \frac{1}{z} dz$ , where $C$ the circle is $x = \cos t, y = \sin t,$ $0 \le t \le 2\pi$ . — CO4 — L2

e) Find the poles and residues of the function $\frac{z^2}{(z-1)(z-2)^2}$ . — CO5 — L4

## PART-B

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

Marks | CO | Blooms Level

### UNIT–I

2. a) Find the Laplace Transformation of $f(t) = \frac{e^{-at} - e^{-bt}}{t}$ . — 6M — CO1 — L3

b) Show that $\int_0^\infty e^{-3t} t \sin t \, dt = \frac{3}{50}$ . — 6M — CO1 — L3

**OR**

3. a) Find the Laplace Transform of $f(t) = t^2, 0 < t < 2$ where $f(t+2) = f(t)$ . — 6M — CO1 — L1

b) Find the Laplace Transformation of $f(t) = t \sin^3 t$ . — 6M — CO1 — L1

**UNIT–II**

4. a) Find the inverse Laplace Transformation of

$$F(s)=\frac{3s+1}{(s+1)(s^2+2)}.$$

12M CO2 L3

**OR**

5. Solve the differential equation

$$\frac{d^2y}{dt^2}-2\frac{dy}{dt}+y=e^t;\ y(0)=2;\ y'(0)=-1$$

by using Laplace Transformation. 12M CO2 L3

**UNIT–III**

6. Find Fourier Cosine and Sine series for the function $f(x)=x-x^2$ in $0<x<1$. 12M CO3 L4

**OR**

7. a) Find Fourier transform of $f(x)=\begin{cases}1+\frac{x}{a} & -a<x<0\\ 1-\frac{x}{a} & 0<x<a\\ 0 & otherwise\end{cases}$. 6M CO3 L1

b) Find the Fourier sine transform of $f(x)=e^{-ax}, a>0$. 6M CO3 L1

**UNIT–IV**

8. Show that the function $u=e^{-2xy}\sin(x^2-y^2)$ is harmonic. Find the conjugate function $v$ and express $u+iv$ as an analytic function of $z$. 12M CO4 L2

**OR**

9. Evaluate $\int_C \frac{1}{z^2+9}dz$ where $C$ is

(i) $|z-3i|=4$ (ii) $|z+3i|=2$ (iii) $|z|=5$. 12M CO4 L2

## UNIT–V

10. a) Expand $f(z)=\dfrac{z}{(z+1)(z+2)}$ in Taylor series about $z=2$. 6M CO5 L2

    b) State Cauchy Residue theorem and hence evaluate $\int_C \dfrac{\sin\pi z^2+\cos\pi z^2}{(z-1)^2(z-2)}dz$ where the contour $C$ is $|z|=3$. 6M CO5 L2

**OR**

11. a) Expand $f(z)=\dfrac{8z+1}{z(1-z)}$ in a Laurent series valid for $0<|z|<1$. 6M CO5 L3

    b) State Cauchy Residue theorem and hence evaluate $\int_C \dfrac{1}{(z-1)(z+2)^2}dz$ where the contour $C$ is

    (i) $|z|=\dfrac{3}{2}$ (ii) $|z|=3$. 6M CO5 L3

*** End ***

| Hall Ticket Number : | | | | | | | | | | |
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**R-20**

**Code: 20A233T**

II B.Tech. I Semester Regular Examinations March 2022

# Analog Electronics

( Electrical and Electronics 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 mark.**
3. Answer **ALL** the questions in **Part-A** and **Part-B**

## PART-A
**(Compulsory question)**

| | | CO | Blooms Level |
|---|---|---|---|
| **1.** | **Answer *all* the following short answer questions ( 5 X 2 = 10M )** | | |
| a) | List out advantages and disadvantages of negative feedback. | CO1 | L2 |
| b) | Draw the circuit diagram for an integrator. | CO2 | L2 |
| c) | Discuss the significance of RC Active Filters | CO3 | L2 |
| d) | Draw the pin diagram of IC 555. | CO4 | L2 |
| e) | Draw the circuit diagram of 3-bit R-2R Ladder DAC. | CO5 | L2 |

## PART-B
**Answer any *five full* questions by choosing one question from each unit ( 5 x 12 = 60 Marks )**

| | | Marks | CO | Blooms Level |
|---|---|---|---|---|
| | **UNIT–I** | | | |
| 2. | Explain the circuit diagram of Hartley oscillator with a neat diagram and derive the expression for frequency of oscillation. | 12M | CO1 | L2 |
| | **OR** | | | |
| 3. | Explain the operation of wien bridge oscillator and derive its frequency of oscillation with neat sketch. | 12M | CO1 | L2 |
| | **UNIT–II** | | | |
| 4. a) | Discuss the operation of ideal differentiator and mention its drawbacks. Explain the practical differentiator with relevant sketches. | 9M | CO2 | L2 |
| b) | Explain about the operational amplifier block diagram? | 3M | CO2 | L2 |
| | **OR** | | | |
| 5. a) | Explain the operation of the instrumentation amplifier? | 7M | CO2 | L2 |
| b) | Explain the following<br>i) Input offset voltage ii) Input offset current iii) CMRR | 5M | CO2 | L2 |

**UNIT–III**

| | | | | | |
|---|---|---|---|---|---|
| 6. | a) | Explain the working principle and operation of Schmitt trigger using Op-Amp with relevant sketch | 8M | CO3 | L2 |
| | b) | Explain opamp based Half-wave Rectifier | 4M | CO3 | L2 |
| | | **OR** | | | |
| 7. | | Construct and explain the working principle of a Sawtooth wave generator using Op-amp. | 12M | CO3 | L2 |
| | | **UNIT–IV** | | | |
| 8. | | Explain the operation of 555 Timer as an Astable multivibrator and derive an expression for time period of the output waveform | 12M | CO4 | L2 |
| | | **OR** | | | |
| 9. | | Discuss the following applications of Monostable mode using 555 timer. i) Missing pulse detector ii) Linear ramp generator | 12M | CO4 | L2 |
| | | **UNIT–V** | | | |
| 10. | | Explain the operation of Successive Approximation ADC, with relevant functional diagram and its logic circuits. | 12M | CO5 | L2 |
| | | **OR** | | | |
| 11. | a) | Draw the circuit of weighted resistor DAC and derive expression for output-analog voltage. | 8M | CO5 | L2 |
| | b) | What are the specifications of IC AD 574(12 bit ADC)? | 4M | CO5 | L2 |

*** End ***

| ~~Hall T~~icket Number : | | | | | | | | | | |
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**R-20**

**Code: 20A232T**

II B.Tech. I Semester Regular Examinations March 2022

# Network Analysis and Signals

( Electrical and Electronics Engineering )

Max. Marks: 70 Time: 3 Hours

*********

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

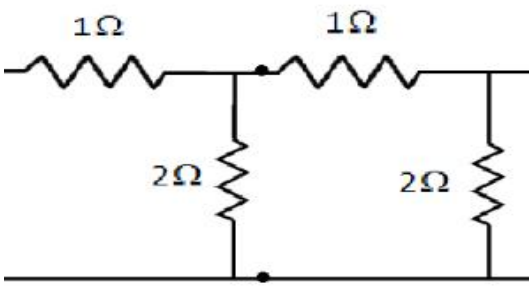
## PART-A

**(Compulsory question)**

| | | | CO | Blooms Level |
|---|---|---|---|---|
| 1. | Answer ***all*** the following short answer questions | ( 5 X 2 = 10M ) | | |
| a) | List the dependent and independent variables of hybrid parameters in terms of network parameters. | | 1 | L1 |
| b) | State initial value theorem. | | 2 | 1 |
| c) | Define the role of initial conditions in transients. | | 3 | 1 |
| d) | Define unit signum function. | | 4 | 1 |
| e) | Define even function symmetry. | | 5 | 1 |

## PART-B

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

| | | | Marks | CO | Blooms Level |
|---|---|---|---|---|---|
| | | **UNIT–I** | | | |
| 2. | a) | Determine the relation between y and z parameters. | 5M | 1 | 3 |
| | b) | A two port network has the following parameters: $Z_{22}$ = 40 Ω, $Z_{11}$ = 30 Ω and $Y_{12}$ = 0.05 Ω. Calculate ABCD parameters. | 7M | 1 | 3 |
| | | **OR** | | | |
| 3. | a) | Determine the relation between A, B, C, D and y parameters. | 5M | 1 | 3 |
| | b) | Determine the y- parameters of the network shown below:   | 7M | 1 | 3 |

**UNIT–II**

| | | | | | |
|---|---|---|---|---|---|
| 4. | a) | Derive the Laplace transform of sin ωt. | 6M | 2 | 6 |
| | b) | Apply Laplace transform concept to R-L series circuit. | 6M | 2 | 3 |

**OR**

| | | | | | |
|---|---|---|---|---|---|
| 5. | a) | Derive the Laplace transform of unit ramp function. | 6M | 2 | 6 |
| | b) | Apply Laplace transform concept to R-C series circuit. | 6M | 2 | 3 |

**UNIT–III**

| | | | | | |
|---|---|---|---|---|---|
| 6. | | Analyze the response of series R-L-C circuit when excited by a dc voltage. | 12M | 3 | 4 |

**OR**

| | | | | | |
|---|---|---|---|---|---|
| 7. | | Analyze the response of series R-L circuit when excited by a sinusoidal voltage. | 12M | 3 | 4 |

**UNIT–IV**

| | | | | | |
|---|---|---|---|---|---|
| 8. | | Explain the classification of continuous time signals. | 12M | 4 | 2 |

**OR**

| | | | | | |
|---|---|---|---|---|---|
| 9. | a) | Find the convolution of the following signals $x_1(t)=e^{-3t}u(t)$ and $x_2(t)=u(t)$. | 6M | 4 | 2 |
| | b) | State the properties of Cross-correlation function. | 6M | 4 | 3 |

**UNIT–V**

| | | | | | |
|---|---|---|---|---|---|
| 10. | | Determine the effective value of voltage, current and power and power factor if, $v(t) = 10+6\cos(50t+450) + 1.8\cos(150t-100)$ and $i(t) = 3+1.4\cos(50t+200) + 0.5\cos 150t$ | 12M | 5 | 5 |

**OR**

| | | | | | |
|---|---|---|---|---|---|
| 11. | | Explain any four properties of Fourier transforms. | 12M | 5 | 2 |

*** End ***

| Hall Ticket Number : | | | | | | | | | | |
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**R-20**

**Code: 20A231T**

II B.Tech. I Semester Regular Examinations March 2022

# Electrical Machines - I

( Electrical and Electronics 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 mark.**
3. Answer **ALL** the questions in **Part-A** and **Part-B**

## PART-A

**(Compulsory question)**

| | | CO | Blooms Level |
|---|---|---|---|
| 1. | Answer ***all*** the following short answer questions ( 5 X 2 = 10M ) | | |
| a) | What is the purpose of brushes and bearings in DC machines? | 1 | 1 |
| b) | Define critical resistance of a DC machine? | 2 | 4 |
| c) | What is the significance of separation of losses test on DC machines? | 3 | 3 |
| d) | What is the effect of voltage variation on iron losses? | 4 | 3 |
| e) | What are the conditions to be satisfied for parallel operation of single phase transformers? | 5 | 2 |

## PART-B

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

| | | | Marks | CO | Blooms Level |
|---|---|---|---|---|---|
| | | **UNIT–I** | | | |
| 2. | a) | Derive the EMF equation of a DC generator? | 6M | 1 | 1 |
| | b) | Define Commutation and explain the process of commutation in DC generators? | 6M | 1 | 1 |
| | | **OR** | | | |
| 3. | a) | What is demagnetizing and cross magnetizing effects of armature reaction in a DC machine? | 6M | 1 | 1 |
| | b) | A 4 pole generator with wave wound aramature has 51 slots each having 48 conductors. The flux per pole is 7.5 mWb. At what speed must the armature be driven to give an induced EMF of 440V? | 6M | 1 | 1 |
| | | **UNIT–II** | | | |
| 4. | | Explain the process of building up of a voltage in a DC shunt generator and give the conditions to be satisfied for voltage build up? | 12M | 1 | 1 |
| | | **OR** | | | |
| 5. | a) | With neat circuit diagram, explain how the magnetization characteristics can be obtained for separately excited DC machine? | 8M | 2 | 4 |
| | b) | Distinguish between self-excited and separately excited DC generators? | 4M | 2 | 4 |

**UNIT–III**

| | | | | | |
|---|---|---|---|---|---|
| 6. | a) | Derive the torque equation of a DC motor? | 4M | 3 | 3 |
| | b) | Discuss the different methods of speed control of a DC motor? | 8M | 1 | 1 |
| | | **OR** | | | |
| 7. | a) | Describe Hopkinson's test with the help of a neat circuit diagram to find the efficiency of a DC machine? | 6M | 3 | 3 |
| | b) | The Hopkinson's test on two shunt machines gave the following results on full-load. Line voltage=250V;Line current excluding field currents=50A, Motor armature current=380A; Field currents are 5A and 4.2A. Assuming resistance of each machine as 0.02Ω, determine the efficiency of each machine? | 6M | 3 | 3 |

**UNIT–IV**

| | | | | | |
|---|---|---|---|---|---|
| 8. | a) | Develop the phasor diagram of a single phase transformer under no-load condition? | 6M | 4 | 3 |
| | b) | Derive the conditions for zero regulation and maximum regulation of a transformer? | 6M | 4 | 3 |
| | | **OR** | | | |
| 9. | a) | With neat circuit diagram explain the parameters obtained from Open Circuit test and Short Circuit test? | 6M | 4 | 3 |
| | b) | A 40 KVA single phase transformer has iron losses of 800 W and copper losses of 1140 W when supplying it's full load at unity power factor. Calculate the efficiency of the transformer at unity power factor at i) Full load ii) Half load | 6M | 4 | 3 |

**UNIT–V**

| | | | | | |
|---|---|---|---|---|---|
| 10. | a) | Derive an expression for saving of conductor material in an auto transformer over a two winding transformer of equal rating? | 6M | 4 | 3 |
| | b) | Explain with the help of connection and phasor diagrams, how Scott connections are used to obtain two phase supply from three phase supply mains? | 6M | 5 | 2 |
| | | **OR** | | | |
| 11. | a) | Two single phase transformers are operating in parallel. Derive an expression for the current drawn by each, sharing a common load, when no-load voltages of these are not equal? | 6M | 5 | 2 |
| | b) | Compare two winding transformer with an auto transformer. | 6M | 5 | 2 |

*** End ***