| Hall Ticket Number : | | | | | | | | | | |
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**R-19**

**Code: 19A232T**

II B.Tech. I Semester Supplementary Examinations June 2024

# Circuit Theory

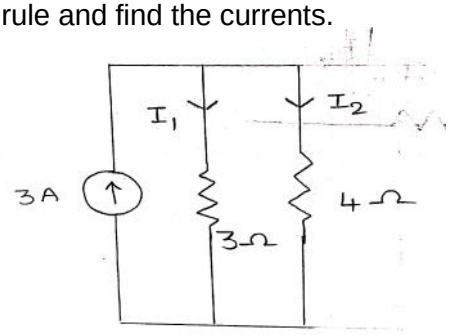
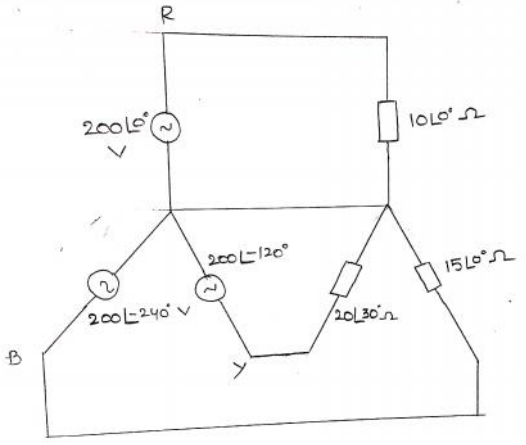
(Electrical and Electronics Engineering)

Max. Marks: 70 Time: 3 Hours

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

*********



| | | | Marks | CO | BL |
|---|---|---|---|---|---|
| | | **UNIT–I** | | | |
| 1. | a) | Explain Super-Mesh with an example. | 7 M | 1 | 2 |
| | b) | Apply Current division rule and find the currents.   | 7M | 1 | 3 |
| | | **OR** | | | |
| 2. | a) | Explain nodal analysis with an example. | 7M | 1 | 2 |
| | b) | Describe Voltage and Current division rules with examples. | 7M | 1 | 1 |
| | | **UNIT–II** | | | |
| 3. | a) | List out different types of AC waveforms. | 7M | 2 | 1 |
| | b) | List out any five advantages of an AC supply. | 7M | 2 | 1 |
| | | **OR** | | | |
| 4. | a) | Determine the expression for Resonant frequency of a series RLC circuit. | 6M | 2 | 3 |
| | b) | A coil having a resistance of 20 Ohms and an inductance of 0.2 H is connected in series with a 50 µF capacitor across a 250 V, 50 Hz supply. Calculate (i) the current (ii) the power (iii) the power factor (iv) the voltage across the coil and capacitor. Draw the phasor diagram showing the current and various voltages. | 8M | 2 | 3 |
| | | **UNIT–III** | | | |
| 5. | | Determine the relationship between line voltage and phase voltage for a balanced 3-Ø star connected system with suitable diagrams. | 14M | 3 | 3 |
| | | **OR** | | | |
| 6. | a) | Define phase and phase sequence. | 4M | 3 | 1 |
| | b) | Calculate the line currents and phase currents for the following network.   | 10M | 3 | 3 |

**UNIT–IV**

| | | | | | |
|---|---|---|---|---|---|
| 7. | a) | Explain millman's theorem with an example. | 7M | 4 | 2 |
| | b) | Explain Telligen's theorem with an example. | 7M | 4 | 2 |
| | | **OR** | | | |
| 8. | a) | Explain Nortorn's theorem with an example | 7M | 4 | 2 |
| | b) | Explain Reciprocity theorem with an example. | 7M | 4 | 2 |

**UNIT–V**

| | | | | | |
|---|---|---|---|---|---|
| 9. | a) | Define i) graph ii) tree iii) link iv)twig | 7M | 6 | 1 |
| | b) | Define i) link ii) Twig iii) tree iv) co-tree with a suitable diagram | 7M | 6 | 1 |
| | | **OR** | | | |
| 10. | a) | Explain Self-Inductance and Mutual inductance. | 5M | 5 | 2 |
| | b) | Develop an expression for equivalent inductance of two coupled coils connected in parallel aiding with mutual inductance. | 9M | 5 | 3 |

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

**Code: 20A231T**

II B.Tech. I Semester Supplementary Examinations June 2024

# 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 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 principle of DC Generator | 1 | L2 |
| b) | Define Critical Field Resistance and Critical Speed | 2 | L2 |
| c) | List out the Losses of DC Machines | 3 | L2 |
| d) | Why the single phase transformer will not work with DC? | 4 | L2 |
| e) | Draw the Three Phase Transformer Connections. | 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. | With a neat diagram, explain the constructional features of a DC generator. Explain each part of it. | 12M | 1 | L2 |
| | **OR** | | | |
| 3. a) | Derive EMF equation of a DC Generator | 6M | 1 | L2 |
| b) | A four pole generator having wave-wound armature winding has 51 slots each slot containing 20 conductors. What will be the voltage generated in the machine when driven at 1500rpm assuming the flux per pole to be 7.0mWb? | 6M | 1 | L3 |
| | **UNIT-II** | | | |
| 4. a) | Bring out the reasons for the failure of self-excitation of a DC machine. | 6M | 2 | L3 |
| b) | Draw and explain Load characteristics of shunt generator | 6M | 2 | L3 |
| | **OR** | | | |
| 5. a) | Draw and explain series and compound generators. | 6M | 2 | L3 |
| b) | A series generator delivers 100A at 250V and the resistance of the series field and armature resistance are 0.055Ω and 0.1Ω respectively. Calculate the armature current and generated emf. | 6M | 2 | L3 |

## UNIT-III

| | | | | | |
|---|---|---|---|---|---|
| 6. | a) | Explain the principle of operation of DC Motor | 6M | 3 | L2 |
| | b) | Explain Swinburne's test on DC machines. Also state its advantages & disadvantages | 6M | 3 | L3 |
| | | **OR** | | | |
| 7. | a) | Explain 3-point starter with a neat diagram. | 6M | 3 | L3 |
| | b) | A 220V DC series motor is running at a speed of 800rpm and draws 100A. Calculate at what speed the motor will run when developing half the torque. Total resistance of armature and field is 0.1Ω. Assume that the magnetic circuit is unsaturated. | 6M | 3 | L3 |

## UNIT-IV

| | | | | | |
|---|---|---|---|---|---|
| 8. | a) | Derive an expression for the induced e.m.f of a transformer | 6M | 4 | L2 |
| | b) | Draw and explain the phasor diagram of the transformer operating at lagging power factor load | 6M | 4 | L4 |
| | | **OR** | | | |
| 9. | a) | With the help of neat circuit diagram explain OC & SC test on single phase transformers | 6M | 4 | L2 |
| | b) | The emf per turn for a single phase transformer is 1.1 V. When the primary winding us connected to a 220 V 50 Hz A.C. supply, the secondary voltage is found to be 550 V. Calculate: (i) The number of primary and secondary turns. (ii) The net cross-sectional area of the core, for a maximum flux density of 1.1 T. | 6M | 4 | L3 |

## UNIT-V

| | | | | | |
|---|---|---|---|---|---|
| 10. | a) | What is an auto transformer? What is the difference between auto transformer and two winding transformer? | 6M | 5 | L3 |
| | b) | A two-winding transformer is rated at 2400/240V, 50KVA. It is reconnected as a step-up auto-transformer, with 2400V input. Calculate the rating of the autotransformer and the inductively and conductively transferred powers while delivering the rated output at unity power-factor. | 6M | 5 | L3 |
| | | **OR** | | | |
| 11. | | Explain in detail about Scott Connection with neat sketch and related phasor diagrams | 12M | 5 | L4 |

*** End ***

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

**Code: 20A232T**

II B.Tech. I Semester Supplementary Examinations June 2024

# 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 marks.**
3. Answer **ALL** the questions in **Part-A** and **Part-B**

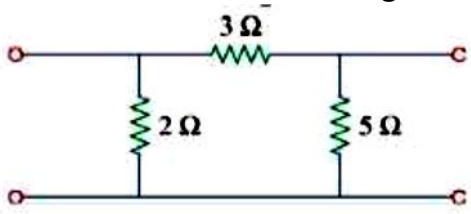
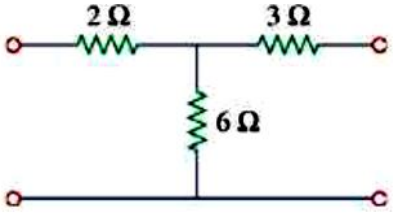
## PART-A

**(Compulsory question)**

| | | CO | BL |
|---|---|---|---|
| 1. | Answer ***all*** the following short answer questions ( 5 X 2 = 10M ) | | |
| a) | Define transfer admittance and impedance of two port network | CO1 | L1 |
| b) | Find L[t(sin2t)] | CO3 | L3 |
| c) | What are the initial conditions for Resistor? | CO2 | L1 |
| d) | Define unit impulse and unit step signal | CO4 | L1 |
| e) | Find Fourier Cosine integral representation of the function $f(x) = 1, 0<x<1$ $= 0, x>1$ | 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) | Find the Z- parameters for the following circuit.   | 7M | CO1 | L3 |
| b) | Express ABCD parameters in terms of h parameters | 5M | CO1 | L3 |
| | **OR** | | | |
| 3. a) | Find the ABCD parameters for the following circuit.   | 7M | CO1 | L3 |
| b) | Express Y parameters in terms of h parameters. | 5M | CO1 | L3 |
| | **UNIT-II** | | | |
| 4. | Find the signal y(t), the Laplace transform of signal which is $Y(S) = (S^3+7S^2+18S+20) / (S^2+5S+6)$ | 12M | CO3 | L4 |
| | **OR** | | | |

5. A 500Ω resister, a 16Mh inductor, and a 25 nF capacitor are connected in parallel which is placed in series with a 2000Ω resistor. Express the impedance of this series combination as a rational function of s. 12M CO3 L4

**UNIT-III**

6. A series RL circuit with R=30Ω and L=15H has a constant voltage V=60V applied at t=0. Determine the current I, the voltage across the resistor and across the inductor. 12M CO2 L3

**OR**

7. Derive the transient response of an RLC circuit with dc excitation. 12M CO2 L4

**UNIT-IV**

8. a) With neat graphical representation explain different types of continuous time signals with examples. 6M CO4 L2

   b) Draw the signal x(t) = 1; 0<t<1
   2; 1<t<2
   0; elsewhere
   also determine and sketch (i) x(2t) (ii) X(3t-1) 6M CO4 L3

**OR**

9. a) Determine whether or not each of the following signals is periodic. If a signal is periodic, determine its fundamental period.

   $(a)\ x(t) = \cos\left(t + \frac{\pi}{4}\right)$ $(b)\ x(t) = \sin\frac{2\pi}{3}t$

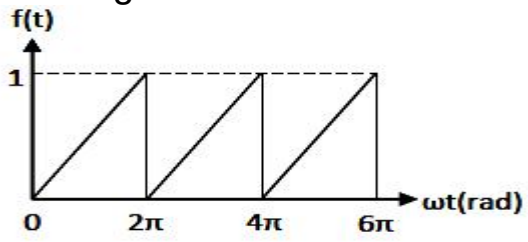
   $(c)\ x(t) = \cos\frac{\pi}{3}t + \sin\frac{\pi}{4}t$ $(d)\ x(t) = \cos t + \sin\sqrt{2}t$ 6M CO4 L3

   b) Identify which of the following signals are energy signals, power signals and neither power nor energy signals.
   i) $x(t) = e^{-3t}u(t)$ ii)x(t) = cost iii)x(t) = t u(t) 6M CO4 L1

**UNIT-V**

10. a) Explain even, odd and half wave symmetry property by using relevant examples. 6M CO5 L2

    b) Express the Trigonometric Fourier series expansion of the waveform shown in fig.




6M CO5 L3

**OR**

11. a) State and prove the convolution theorem for Fourier Transforms. 6M CO5 L4

    b) Find the Fourier series coefficients for the following signal, x(t)= 1 + cos(2πt) 6M CO5 L3

*** End ***

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

**Code: 20A234T**

II B.Tech. I Semester Supplementary Examinations June 2024

# 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 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) | Represent $(5137)_{10}$ in Gray code | | CO1 | L3 |
| b) | Write the POS form of the SOP expression f (x,y,z) = x'yz + xyz' + xy'z | | CO2 | L3 |
| c) | How will you decide the size of a PLA array? | | CO3 | L4 |
| d) | Define critical race in asynchronous sequential circuit. | | CO4 | L1 |
| e) | Define a state box. | | 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. | a) | Find out X and Y. $(537.25)_8 = (X)_2$ , $(1A5B)_{16} = (Y)_8$ | 6M | CO1 | L3 |
| | b) | Device a single error correcting code for a 11- bit group 01101110101. | 6M | CO1 | L3 |
| | | **OR** | | | |
| 3. | a) | What is Hamming code? How is the Hamming code word tested and corrected? | 6M | CO1 | L2 |
| | b) | Find the 1's complement and 2's complement of $(101101)_2$ and $(111101)_2$. | 6M | CO1 | L3 |
| | | **UNIT-II** | | | |
| 4. | a) | Find the simplified Boolean function for the given function using K-map and implement it using logic gates. F (A, B, C, D) =∑m (0, 8, 11, 12, 15) +∑d (1, 2, 4, 7, 10, 14). Give the essential prime implicants | 6M | CO2 | L3 |
| | b) | Implement the function F = B' D + A C using only NAND gates. | 6M | CO2 | L3 |
| | | **OR** | | | |
| 5. | a) | Simplify the following Boolean expressions to a minimum number of literals. (i) (A' + C') ( A + B' +C') | 4M | CO2 | L3 |

| | | | | | |
|---|---|---|---|---|---|
| | b) | Simplify the following Boolean function F , together with the don't-care conditions d, and then express the simplified function in sum-of-minterms form:<br>F (w,x, y,z) =∑ m (0, 6, 8, 13, 14) ,<br>d( w,x,y,z) = ∑ m (2,4,10) | 8M | CO2 | L3 |

**UNIT-III**

| | | | | | |
|---|---|---|---|---|---|
| 6. | a) | Design a full adder using 4x1 multiplexer, also write its truth table and draw the logical diagram. | 6M | CO3 | L5 |
| | b) | Discuss the different types of Programmable logic devices. | 6M | CO3 | L2 |

**OR**

| | | | | | |
|---|---|---|---|---|---|
| 7. | a) | Consider the following boolean functions and implement the circuit using PLA. F1=AB'+AC+A'BC' F2= (AC+BC)' | 8M | CO3 | L3 |
| | b) | Mention the application of flash memory devices. | 4M | CO3 | L2 |

**UNIT-IV**

| | | | | | |
|---|---|---|---|---|---|
| 8. | a) | A sequential circuit with two D flipflops A and B, one input x and one output y is specified by the following equation<br>$D_A$ = A.x'+ B.x $D_B$ = A' .x and output y = (A + B). x'<br>Draw the sequential circuit, state table and state diagram for the given specifications. | 8M | CO4 | L5 |
| | b) | Represent the logic circuit of a synchronous up counter. | 4M | CO4 | L2 |

**OR**

| | | | | | |
|---|---|---|---|---|---|
| 9. | a) | Design and explain the working of a ripple 3 bit binary down counter. | 8M | CO4 | L5 |
| | b) | Analyze the characteristic table and excitation table of T flipflop. | 4M | CO4 | L4 |

**UNIT-V**

| | | | | | |
|---|---|---|---|---|---|
| 10. | | Draw an ASM chart, state diagram and state table for the synchronous circuit having the following description:The circuit has control input C, clock, and outputs x, y, z.<br>(a) If C = 1, on every clock rising edge, the code on the output x, y, z changes from 001→011101111001 and repeats. (b) If C = 0, the circuit holds the present state. | 12M | CO5 | L5 |

**OR**

| | | | | | |
|---|---|---|---|---|---|
| 11. | a) | Draw the ASM chart for a sequence detector to detect the sequences 1011 and 1101. It has to output a 1 when the sequence is detected. Overlapping is not permitted. | 10M | CO5 | L5 |
| | b) | Differentiate between ASM chart and conventional flow chart. | 2M | CO5 | L4 |

*** End ***

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

**Code: 20AC32T**

II B.Tech. I Semester Supplementary Examinations June 2024

# Transform Techniques & Complex Variables

(Common to EEE &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) Find Laplace transform of tcosat. CO1 L4

b) Find the inverse transforms of $\frac{s+2}{(s^2-4s+13)}$ CO2 L2

c) Find $a_0$ in the expansion of f(x)=xsinx. CO3 L4

d) Evaluate using Cauchy's integral formula $\int_c \frac{e^{2z}}{(z-1)(z-2)} dz$ , where C is the circle |z|=3. CO4 L2

e) Find the nature and location of singularities of 1/ (cosz-sinz). 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) Find the Laplace transform of f(t) = $\begin{cases} \frac{t}{\tau}, & when\ 0 < t < \tau \\ 1, & when\ t > \tau \end{cases}$ 6M CO1 L3

b) Find the Laplace transform of the triangular wave of period 2a given by

f(t) =t, 0<t<a

=2a-t, a<t<2a. 6M CO1 L1

**OR**

3. a) Evaluate $L\{t \int_0^t \frac{e^{-t}\sin t}{t} dt\}$ 6M CO1 L2

b) Find $L(te^{at}\int_0^t \frac{e^{-t}\sin t}{t})$ 6M CO1 L1

## UNIT–II

4. Find the inverse transforms of $\frac{2s^2-6s+5}{s^3-6s^2+11s-6}$ — 12M CO2 L3

**OR**

5. Solve ty''+2y'+ty=cost given that y(0)=1 — 12M CO2 L3

## UNIT–III

6. Obtain the Fourier expansion of xsinx as a cosine series in (0,π). — 12M CO3 L4

**OR**

7. Find the Fourier cosine transform of $f(x)=1/(1+x^2)$.
Hence derive Fourier sine transform of $\varphi(x) = x/(1+x^2)$. — 12M CO3 L1

## UNIT–IV

8. a) If ω=φ+iψ represents the complex potential for an electric field and $\psi=\frac{x}{x^2-y^2+x^2+y^2}$, determine the function φ. — 6M CO4 L1

b) If $F(\varsigma)=\int_c \frac{4z^2+z+5}{z-\varsigma}dz$, where C is the ellipse $(x/2)^2+(y/3)^2=1$, find the value of F(3.5). — 6M CO4 L2

**OR**

9. Evaluate $\int_c \frac{e^z}{(z^2+\pi^2)^2}dz$, where c is |z|=4 by using Cauchy Integral formula — 12M CO4 L2

## UNIT–V

10. Find the Laurents' expansion of $f(z)=\frac{7z-2}{(z+1)z(z-2)}$ in the region 1<z+1<3. — 12M CO5 L2

**OR**

11. Evaluate $\int_c \frac{\sin\pi z^2+\cos\pi z^2}{(z-1)^2(z-2)}dz$, where C is the circle |z|=3 by using residue threorem. — 12M CO5 L2

*** End ***

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

**Code: 20A233T**

II B.Tech. I Semester Supplementary Examinations June 2024

# Analog Electronics

(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 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) | State the Barkhausen criterion for an oscillator. | 1 | L1 |
| b) | List the ideal characteristics of op-amp. | 2 | L1 |
| c) | Draw and explain op-amp based zero detector circuit. | 3 | L2 |
| d) | Explain the importance of control voltage pin 5 of the timer 555 | 4 | L1 |
| e) | What is the advantage of R-2R ladder D/A converter over the one with binary weighted resistors? | 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) | What are the different types of feedback amplifiers? Give their equivalent circuits | 6M | 1 | L2 |
| | b) | Compare positive feedback and negative feedback. | 6M | 1 | L2 |
| | | **OR** | | | |
| 3. | a) | Explain the working of a Colpitts oscillator. | 6M | 1 | L2 |
| | b) | In an RC Phase shift oscillator, R=200kΩ and C=200pF. Find the frequency of the BJT based oscillator. | 6M | 1 | L3 |
| | | **UNIT–II** | | | |
| 4. | | Draw the internal block diagram of op-amp and explain each block | 12M | 2 | L2 |
| | | **OR** | | | |
| 5. | | List any five DC characteristics of OP-AMP and Explain. | 12M | 2 | L2 |
| | | **UNIT–III** | | | |
| 6. | a) | Compare and contrast Schmitt trigger and Comparator. | 6M | 3 | L3 |
| | b) | Explain how op-amp can work as Astable multivibrator | 6M | 3 | L3 |
| | | **OR** | | | |

| | | | | | |
|---|---|---|---|---|---|
| 7. | a) | Draw and explain the operation of peak detector circuit using op-amp | 6M | 3 | L2 |
| | b) | With a neat diagram explain the working of op-amp comparator. | 6M | 3 | L2 |

**UNIT–IV**

| | | | | | |
|---|---|---|---|---|---|
| 8. | | Derive the expression for the Duty cycle of an Astable Multi-vibrator using IC555. | 12M | 4 | L3 |

**OR**

| | | | | | |
|---|---|---|---|---|---|
| 9. | a) | How PLL is used for frequency multiplier? Explain. | 6M | 4 | L2 |
| | b) | Compute the free running frequency fo, lock in range and capture range of PLL 565. Assume RT=20 k-ohm, CT=0.01μF, C=1μF and supply voltage is ±6v. | 6M | 4 | L3 |

**UNIT–V**

| | | | | | |
|---|---|---|---|---|---|
| 10. | a) | Draw the circuit diagram of binary-weighted resistor DAC and explain its working. | 6M | 5 | L2 |
| | b) | For the D/A converter using an R-2R ladder network, determine the size of each step if Rf = 27kΩ and R= 10kΩ and also calculate the output voltage when the inputs b0, b1, b2 and b3 are at 5V. | 6M | 5 | L3 |

**OR**

| | | | | | |
|---|---|---|---|---|---|
| 11. | a) | Describe Parallel Comparator type ADC operation. | 6M | 5 | L2 |
| | b) | Discuss the operation of counter type ADC. | 6M | 5 | L2 |

*** End ***