II B. Tech II Semester Regular Examinations, June/July - 2022
ELECTRONIC CIRCUIT ANALYSIS
(Common to ECE, EIE, & ECT)

Time: 3 hours　　　　　　　　　　　　　　　　　　　　　　Max. Marks: 70

Answer any **FIVE** Questions each Question from each unit
All Questions carry **Equal** Marks
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UNIT-I

1 a) Derive the voltage gain equation for common source amplifier at high frequencies.　[7M]

   b) Explain various high frequency parameters of a BJT and derive the relations between them.　[7M]

Or

2　Determine the all hybrid $-\pi$ parameters of a Transistor operating at Collector Current $I_C(Q)=2mA$, $V_{CE}(Q)=20V$ and $I_B(Q)=20\mu A$. Transistor specifications are $\beta_0=100$, unity gain frequency $f_T = 50MHz$, $C_{OB}=3pF$, $h_{iE}=1.4K\Omega$, $h_{re}=2.5*10^{-4}$, hoe=25µmhos. Assume that the Operating temperature is 300^0K.　[14M]

UNIT-II

3 a) Draw the circuit of Boot-strap follower and explain its operation.　[7M]

   b) How Differential amplifier using BJT works?- Discuss.　[7M]

Or

4　A CE-RC coupled amplifier uses transistor with the following h-parameters: $h_{fe}=50$, $h_{oe}=30x10^{-6}$ mhos, $h_{re}=2.5x10^{-4}$. The value of g_m at the operating point is 50m mhos. The biasing resistor R1 between Vcc and base is 100KΩ and R2 between base and ground is 10KΩ. The load resistor $R_C = 5K\Omega$. let C = 160pF be the total shunt capacitance in the input circuit and the coupling capacitor Cc=6µF, Calculate for one stage of the amplifier:
(i) mid-band current gain
(ii) mid-band voltage gain　[14M]

UNIT-III

5 a) With neat block diagram, show that input resistance increases with series mixing.　[7M]

   b) Draw the circuit diagram of a current series feedback amplifier, Deriveexpressions of input & output impedances, Gain, and feedback factor.　[7M]
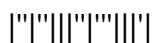
Or

6 a) An amplifier has a gain of 50 with negative feedback. For a specified output voltage, if the input required is 0.1V without feedback and 0.8V with feedback, Compute β and open loop gain.　[7M]

   b) Explain the concept of feedback with block diagram. What are the merits and demerits of positive feedback?　[7M]

UNIT-IV

7 a) Derive the expression frequency of oscillation and condition for sustained oscillations of a Colpitts oscillator.　[7M]

   b) Derive the basic conditions for oscillations and classify oscillators based on their applications.　[7M]

Or

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8   a)   With the help of suitable schematic, explain the operation of a Wien Bridge oscillator and derive an expression for its frequency of operation.   [7M]

     b)   In the Wien-bridge oscillator, if the RC network consists of resistors of 200KΩ and the capacitors of 300pF, find its frequency of oscillation.   [7M]

UNIT-V

9   a)   Distinguish Single and Double tuned amplifiers.   [7M]

     b)   Derive Q factor of a single tuned amplifier.   [7M]

Or

10   a)   Explain the operation of class A push-pull power amplifier.   [7M]

     b)   Show that the conversion efficiency of a transformer coupled power amplifier is 50%.   [7M]

R20

SET - 2

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UNIT-I

1 a) Define f_T and derive an expression for it.   [7M]

   b) Explain various hybrid-pi capacitances and conductance of a BJT.   [7M]

Or

2 a) What are the typical values of various components in hybrid – π model? Show that   [7M]
       at lowfrequencies the hybrid –π model with r_{be} taken as infinite reduces to the
       approximate CE- h – parameter model.
   b) A FET has Drain saturation current I_{DSS} of 10mA and Quiescent point Drain current [7M]
       I_D is 5mA, with pinch –off voltage Vp= -4V, calculate the value of VGS and
       the value of Trans conductance gm.

UNIT-II

3 a) Derive an expression for the overall higher cut-off frequency of a two stage   [7M]
       amplifier with identical stages of individual higher cut-off frequency, f_H.
   b) Discuss about the effect of cascading on bandwidth of multistage amplifiers.   [7M]

Or

4 a) Discuss the effect of coupling capacitors of a CE amplifier on the over all frequency   [7M]
       response of the amplifier.
   b) Draw the circuit diagram, equivalent circuit of a Darlington pair and derive   [7M]
       expressions for overall voltage gain and input impedance.

UNIT-III

5 a) Explain the concept of feedback with block diagrams? What are the advantages and   [7M]
       disadvantages of negative feedback?
   b) An amplifier has a gain of 50 with negative feedback. For a specified output voltage,   [7M]
       if the input required is 0.1V without feedback and 0.8V with feedback,
       Compute β and open loop gain.

Or
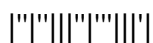
6 Through the block schematics,   [14M]
       i.   Explain four types of negative feedback amplifiers.
       ii. Derive and compare their parameters.

UNIT-IV

7 a) Derive the expression frequency of oscillation and condition for sustained   [7M]
       oscillations of a Colpitt's oscillator.
   b) Explain the concept of frequency and amplitude stability of oscillators.   [7M]
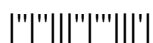
Or

8 a) Derive the expression frequency of oscillation and condition for sustained   [7M]
       oscillations of a FET based RC Phase shift oscillator.
   b) State and explain Barkhausen criterion with different conditions of Loop gain.   [7M]

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UNIT-V

9 a) Draw the equivalent circuit of capacitance coupled single tuned amplifier and derive the equation for voltage gain.   [7M]

   b) What is a Q-factor, Derive the expression for Q-factor of a capacitor?   [7M]

Or

10 a) Explain the operation of class B Push-Pull power amplifier.   [7M]

   b) What is a cross over distortion and explain a remedy for it.   [7M]

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SET - 3

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UNIT-I

1	a)	Perform the high frequency analysis of a common drain amplifier.	[7M]
	b)	Derive the expression for the high frequency parameters in terms of low Frequency parameters of a BJT.	[7M]

Or

2	Define Hybrid-π model. Draw and derive the expressions for different elements of the Hybrid –π model	[14M]

    (i)   Determination of Trans Conductance
    (ii)   Determination of input conductance
    (iii)   Determination of feedback conductance
    (iv)   Determination of outputconductance

UNIT-II

3	a)	With the help of a neat circuit diagram, describe the working of a cascade amplifier.	[7M]
	b)	Differentiate between direct and capacitive coupling of multiple stages ofamplifiers. With the help of a neat circuit diagram, describe the working of a cascade amplifier.	[7M]

Or

4	Draw the equivalent circuits of RC coupled amplifier for Mid-band, Low frequency range, high frequency range and derive the expressions for current gain and voltage gain.	[14M]

UNIT-III

5	a)	Derive the expression for output resistance of a voltage sampled circuit.	[7M]
	b)	Explain the method of identifying feedback Topology.	[7M]

Or

|			
6	a)	With a neat sketch explain a negative feedback amplifier and obtain expression for its closed loop gain.	[7M]
	b)	A voltage-series negative feedback amplifier has a voltage gain without feedback of A=500, input resistance Ri=3KΩ, output resistance of Ro=20KΩ and feedback ratio β=0.01, calculate the voltage gain A_f, input resistance R_{if} and output resistance R_{of} of the amplifier with feedback.	[7M]

UNIT-IV

|			
7	a)	Derive the expression frequency of oscillation and condition for sustained oscillations of a Hartley oscillator.	[7M]
	b)	In an Hartley oscillator, if L1=0.2mH, L2=0.3mH and C=0.003 µF, calculate the frequency of its oscillation.	[7M]

Or
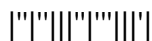
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| 8 | | Discuss and explain the basic circuit of an LC oscillator and derive the condition for the oscillations. | [14M] |

UNIT-V

| 9 | a) | With the help of a suitable circuit diagram, show that the maximum conversion efficiency of a class B power amplifier is 78.5%. | [7M] |
| | b) | Write short notes on Thermal stability and Heat sinks. | [7M] |

<div align="center">Or   [7M]</div>

| 10 | a) | Draw the diagram of a capacitance coupled tuned amplifier and derive an expression for its quality factor. | [7M] |
| | b) | Define efficiency for a power amplifier. Classify power amplifiers based on their class of operation and compare them. | [7M] |
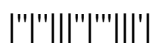
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UNIT-I

1 a) Derive the expression for CE short-circuit current gain with resistive load.   [7M]

   b) Derive the expressions for f_T and f_β.   [7M]

Or

2   Draw the Hybrid- π model for a common emitter transistor. At room temperature   [14M]
       (300K) at IC=10mA and VCE=8V. h_{ie}=500, h_{oe}=2*10^{-4} µs , h_{fe}=100 and h_{re}=10^{-4}.
       At the same operating point f_T=50MHz and c_{ob}=3PF.Calculate the values of hybrid-
       π parameters.

UNIT-II

3 a) Derive the expression for input resistance of a Darlington pair circuit.   [7M]

   b) With the help of a neat circuit diagram, describe the working of a bootstrapping.   [7M]

Or

4 a) Derive expressions for Ri, Ro, Av &Ai using h-parameter model of a CC- CE   [7M]
       amplifier?
   b) Draw the circuit diagram of Direct Coupled Amplifier and explain its operation   [7M]
       in detail.

UNIT-III

5 a) Draw the block diagram of Current Shunt feedback system and derive theexpression   [7M]
       for R_{if} and R_{of}
   b) What is meant by negative feedback in amplifier, enumerate the effects of negative   [7M]
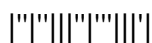   feedback on the various characteristics of the amplifier.

Or

6 a) Draw the circuit of a voltage series feedback amplifier and derive the expressions   [7M]
       for R_{if} and R_{of}
   b) With neat block diagram Derive the expression for overall gain of a negative   [7M]
       feedback circuit.

UNIT-IV

7 a) Derive the expression for frequency of oscillation of BJT- RC phase-shift oscillator   [7M]
       with necessary explanation.
   b) Discuss about Frequency and amplitude stability of oscillators.   [7M]

Or

|"|"|||"|"|||'|

8 a) Write down the expression for frequency of oscillation in Hartley and Colpitts Oscillators. [7M]

   b) A Colpitts Oscillator is designed with C_2=100pF and C_1=7500pF. The inductance is variable, determine the range of inductance values, if the frequency of oscillation is to vary between 950 and 2050 KHz. [7M]

UNIT-V

9 a) Draw the Class-A Power Amplifier and explain operation in detail withnecessary equations. Also derive the expression for maximum conversionefficiency. [7M]

   b) What is meant by distortion in power amplifiers, explain the given different types of distortions? [7M]

Or

10 a) Explain the reasons for oscillations in a tuned amplifier. Briefly explain the methods used to stabilize the tuned amplifiers against oscillations. [7M]

   b) Explain the operation of a double tuned amplifier. Explain the advantages of double tuned circuit over single tuned circuit. [7M]