

II B. Tech II Semester Regular/Supplementary Examinations, July- 2023

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

UNIT-I

- 1 a) Draw the High frequency model of a Transistor. Derive the relationship between high frequency and low frequency parameters. [7M]
b) Compare, CS, CH, and CD amplifier circuits at high frequencies. [7M]

Or

- 2 a) Draw the equivalent diagram of a single stage CE amplifier at high frequencies. Derive the expression for gain under short circuited load conditions. [7M]
b) When a Ge PNP transistor is biased at 2mA, 15V, it has a base width of 1 micron. Find C_e and f_T if $DB=47\text{cm}^2/\text{sec}$. [7M]

UNIT-II

- 3 a) Draw the circuit diagram of cascade amplifier circuit and analyze its performance. [7M]
b) Draw the equivalent circuits of RC coupled amplifier for Mid-band, Low frequency range, high frequency range and derive the expressions for current gain, voltage gain. [7M]

Or

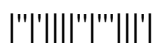
- 4 a) What is Darlington Transistor? What are its silent features? [7M]
b) A multi stage amplifier employs five stages, each of which has a power gain of 30. what is total gain of the amplifier in dB? [7M]

UNIT-III

- 5 a) How does negative feedback reduce distortion in an amplifier? [7M]
b) The distortion in an amplifier is found to be 3%, when the feedback ratio of a negative feedback amplifier is 0.04, when the feedback is removed, the distortion becomes 15%. Find the open loop gain and closed loop gain. [7M]

Or

- 6 a) Compare negative feedback with the positive feedback. [7M]
b) A voltage-series negative feedback amplifier has a voltage gain without feedback of A=500, input resistance $R_i=3\text{K}\Omega$, output resistance of $R_o=20\text{K}\Omega$ and feedback ratio $\beta=0.01$, 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) Draw the circuit of Hartley oscillator and explain its working. Derive the expressions for frequency of oscillation and condition for starting of oscillation. [7M]
- b) In an Hartley oscillator, if $L_1=0.2\text{mH}$, $L_2=0.3\text{mH}$ and $C=0.003\ \mu\text{F}$, calculate the frequency of its oscillation. [7M]

Or

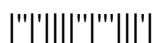
- 8 a) What are factors which affects the frequency stability of an oscillator? [7M]
- b) A Colpitts Oscillator is designed with $C_2=100\text{pF}$ and $C_1=7500\text{pF}$. The inductance is variable, determine the range of inductance values, if the frequency of oscillation is to vary between 950 and 2050 KHz [7M]

UNIT-V

- 9 a) What is meant by distortion in power amplifiers, explain the given different types of distortions. [7M]
- b) If the ideal push-pull amplifier operates at maximum dissipation, show that its efficiency is 50%. [7M]

Or

- 10 a) Draw the equivalent circuit of capacitance coupled single tuned amplifier and derive the equation for voltage gain. [7M]
- b) Explain about the stability of Tuned amplifiers. [7M]



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UNIT-I

- 1 a) Explain how f_{β} and f_T of a BJT can be determined? Obtain the expression for the Gain Bandwidth product of a transistor. [7M]
- b) A single stage Common Emitter amplifier is measured to have a voltage-gain bandwidth f_H of 5 MHz with $R_L = 500$ ohm. Assume $h_{fe}=100$, $g_m = 100$ mA/V, $r_{bb} = 1000$, $C_c = 1$ pf, and $f_T = 400$ MHz. Find the value of the source resistance that will give the required bandwidth. [7M]

Or

- 2 a) Derive the expressions for voltage gain, current gain, input and output resistances of a Common Drain amplifier at high frequencies. [7M]
- b) Derive the expressions for the CE current gain and voltage gain including source resistance R_s . [7M]

UNIT-II

- 3 a) Draw the circuit diagram of Darlington pair circuit and derive its important characteristics. [7M]
- b) Perform the analysis of boot – strapped emitter follower circuit. [7M]

Or

- 4 a) Draw the circuit diagram of a cascade amplifier and derive its overall voltage gain and impedance from its equivalent circuit. [7M]
- b) Derive the expression for voltage gain and input impedance of bootstrap emitter follower amplifier. [7M]

UNIT-III

- 5 a) What are the different types of feedback amplifiers? Give their equivalent circuits. [7M]
- b) Draw the circuit diagram of current shunt feedback and derive expressions for input and output resistance. [7M]

Or

- 6 a) With a neat sketch explain a negative feedback amplifier and obtain expression for its closed loop gain. [7M]
- b) An amplifier requires an input signal of 60mV to produce a certain output. With a negative feedback to get the same output the required signal is 0.5V. The voltage gain with feedback is 90. Find the open loop gain and feedback factor. [7M]



UNIT-IV

- 7 a) Draw the circuit diagram of Wein-bridge oscillator and explain its operation. [7M]
b) In the Wein-bridge oscillator, if the RC network consists of resistors of $200\text{k}\Omega$ and the capacitors of 300pF , find its frequency of oscillation. [7M]

Or

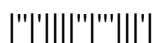
- 8 a) Perform the generalized analysis of LC oscillators with suitable block diagram and obtain the condition for Hartley and colpitt's oscillators. [7M]
b) A phase shift oscillator is to be designed with FET having $g_m = 5000\mu\text{s}$, $r_d = 4\text{k}\Omega$ while the resistance in the feedback circuit is $9.7\text{k}\Omega$. Select the proper value of c and R_D to have the frequency of oscillations as 5KHz . [7M]

UNIT-V

- 9 a) Derive the expression for efficiency of a direct coupled Class A power amplifier. [7M]
b) A single transistor operates as an ideal class B amplifier. If d.c current drawn from the supply is 25mA , calculate the a.c power delivered to load for load of $2\text{k}\Omega$. [7M]

Or

- 10 a) Derive the expression for the gain of a single-tuned capacitance coupled amplifier, Discuss about its Selectivity. [7M]
b) What is the effect of cascading single tuned amplifier on bandwidth? Derive the expression for it. [7M]



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UNIT-I

- 1 a) Derive the expression for f_H and input admittance for emitter follower amplifier at high frequencies. [7M]
b) Write about Gain-Bandwidth product? Explain. [7M]

Or

- 2 a) Write the elements of the Hybrid- π mode. [7M]
b) Draw and Explain about the small signal high frequency equivalent circuit of a Transistor. [7M]

UNIT-II

- 3 a) Derive an expression for the lower 3dB frequency of an RC coupled amplifier by taking the effect emitter bypass capacitor into account. [7M]
b) What is fidelity of an Amplifier? Explain about Frequency response of an amplifier by considering different frequency regions. [7M]

Or

- 4 a) Compare the three types of coupling methods used in multistage amplifiers. [7M]
b) Compute the value of overall current gain and input impedance of a Darlington pair with $1K\Omega$ emitter resistance connected to the emitter of a second transistor if h_{fc} , h_{ic} , h_{oc} and h_{rc} of both the transistor are given as - 51, $1.1k\Omega$, 0 and 1 respectively. [7M]

UNIT-III

- 5 a) Discuss the effect of negative feedback with respect to closed loop gain, bandwidth and distortion. [7M]
b) Calculate the voltage gain, input impedance and output impedance of a voltage series feedback amplifier having an open loop gain $A=300$, $R_i=1.5K\Omega$, $R_o=50K\Omega$ and $\beta=1/20$. [7M]

Or

- 6 a) Explain the method of analysis of feedback amplifier. [7M]
b) An amplifier with negative feedback gives an output of 12.5 with an output of 1.5V. When feedback is removed, it requires 0.25V input for the same output. Find
i) values of voltage gain without feedback [7M]
ii) Value of β , if the input and output are in phase and β is real.



UNIT-IV

- 7 a) Draw the diagram of Colpitt's oscillator and explain its working. [7M]
- b) What are the factors that affect the frequency stability of an oscillator? How frequency stability can be improved in oscillators? [7M]

Or

- 8 a) Draw the circuit diagram of a FET based RC phase shift oscillator and derive the expression for frequency of oscillation and condition for sustained oscillations. [7M]
- b) Discuss about frequency and amplitude stability of oscillators. [7M]

UNIT-V

- 9 a) Draw the circuit and explain the working principle of a complementary symmetry push-pull power amplifier and state its disadvantages. [7M]
- b) Design a class B power amplifier to deliver 30W to a load resistor $R_L = 40 \Omega$ using a transformer Coupling. $V_m = 30V = V_{cc}$. Assume reasonable data wherever necessary. [7M]

Or

- 10 a) What is a tuned amplifier? Explain how tuned amplifiers are classified. [7M]
- b) Discuss about the effect of cascading the tuned amplifiers on Bandwidth. [7M]



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UNIT-I

- 1 a) Derive the expression for output conductance of Hybrid $-\pi$ model. [7M]
b) If a Transistor has a value of $\beta=50$ and Collector current of 10mA, determine the value of Emitter Current and Calculate the value of α of the Transistor. [7M]

Or

- 2 a) Explain various parameters of FET high frequency model. [7M]
b) Explain different Hybrid- π Capacitances and derive necessary expressions. [7M]

UNIT-II

- 3 a) Derive an expression for the lower 3dB frequency of an RC coupled amplifier (using BJT and FET) by taking the effect Coupling capacitor into account. [7M]
b) Draw the circuit for Cascode Amplifier. Explain its working, obtaining overall values of the circuit in terms of h-parameters. [7M]

Or

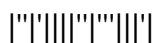
- 4 a) With the help of necessary waveforms, explain about the step response of amplifiers. [7M]
b) What are the advantages of common collector amplifier? Explain how the input resistance of the CC amplifier can be enhanced further. [7M]

UNIT-III

- 5 a) Give the block diagram of a general feedback amplifier. State the function of each block. [7M]
b) If an input of 0.028V peak to peak given to an open loop amplifier, it gives fundamental frequency output of 36V peak to peak, but it is associated with 7% distortion. i) If the distortion is to be reduced to 1%, how much feedback is to be introduced and what will be required input voltage? ii) If 1.2% of output is feedback and the input is maintained at the same level, what is the output voltage? [7M]

Or

- 6 a) Perform the linear analysis of the common collector amplifier using feedback concept. [7M]
b) Write advantages of negative feedback in amplifier. [7M]



UNIT-IV

- 7 a) Draw the circuit diagram of a BJT based RC phase shift oscillator and derive the expression for frequency of oscillation and condition for sustained oscillations. [7M]
b) What is a Colpitt's oscillator and derive an expression for frequency of oscillations. [7M]

Or

- 8 a) What are the differences between an oscillator and an amplifier? Explain the operating principle of an oscillator. [7M]
b) Draw the circuit diagram of a Wien bridge oscillator and derive the expression for frequency of oscillation and condition for sustained oscillations. [7M]

UNIT-V

- 9 a) Derive the expression for maximum conversion efficiency for a simple series fed Class A power amplifier. [7M]
b) push pull amplifier utilizes a transformer whose primary has a total of 160 turns and whose secondary has 40 turns. It must be capable of delivering 40W to an 8Ω load under maximum power conditions. What is the minimum possible value of V_{cc} ? [7M]

Or

- 10 a) Draw the circuit diagram of a double tuned amplifier and derive the expression for 3 dB bandwidth. [7M]
b) Describe the heat sinks for tuned power amplifiers. [7M]

