

Code No: RT22041

R13**SET - 1****II B. Tech II Semester Regular/Supplementary Examinations, April/May-2017****ELECTRONICS CIRCUIT ANALYSIS**

(Com. to ECE, EIE)

Time: 3 hours

Max. Marks: 70

- Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

PART -A

1. a) Define the h-parameter of the Transistor. Draw a h-parameter network representation of a transistor (4M)
- b) What is Darlington Transistor. What are its salient features (4M)
- c) What is meant by feedback in amplifiers, what are the types of feedback (4M)
- d) What are the constituent parts of an Oscillator (4M)
- e) How are amplifiers classified based on the biasing condition (3M)
- f) Mention the application of Class-C tuned amplifier (3M)

PART -B

2. a) With a neat sketch explain about FET (8M)
- b) A FET has Drain saturation current I_{DSS} of 10mA and Quiescent point Drain current I_D is 5mA, with pinch-off voltage $V_p = -4V$, calculate the value of V_{GS} and the value of Transconductance g_m . (8M)
3. a) Explain about Boot-strap follower (8M)
- b) Differential amplifier using BJT (8M)
4. a) With a neat sketch explain a negative feedback amplifier and obtain expression for its closed loop gain (8M)
- 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 (8M)
5. a) Draw the circuit of Hartley oscillator and explain its working. Derive the expressions for frequency of oscillation and condition for starting of oscillation (8M)
- b) In an Hartley oscillator, if $L_1 = 0.2mH$, $L_2 = 0.3mH$ and $C = 0.003 \mu F$, calculate the frequency of its oscillation (8M)
6. a) What is Heat-sink. explain the different types of Heat sinks (8M)
- b) Determine the power dissipation capability of a transistor, which has been mounted with a heat sink having thermal resistance $\Theta_{HS-A} = 8^\circ C/W$, $T_A = 40^\circ C$, $T_J = 160^\circ C$, $\Theta_{J-C} = 5^\circ C/W$ and $\Theta = 85^\circ C/W$ (8M)
7. a) Define Q-factor, derive the expressions for Q factors of RL and RC circuits (8M)
- b) Explain about the stability of Tuned amplifiers (8M)

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2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

PART -A

1. a) Write the elements of the Hybrid- π model (4M)
- b) With a neat sketch explain about Multi stage amplifier (4M)
- c) How does negative feedback reduce distortion in an amplifier (4M)
- d) What are factors which affects the frequency stability of an oscillator (4M)
- e) Why is non-linear distortion called Harmonic distortion (3M)
- f) Define a Q-factor of a resonant circuit (3M)

PART -B

2. Define Hybrid- π model. Draw and derive the expressions for different elements of the Hybrid - π model (16M)
(i) Determination of Trans Conductance (ii) Determination of input conductance
(iii) Determination of feedback conductance (iv) Determination of output conductance
3. Explain about the different Coupling schemes used in amplifiers with diagrams (16M)
4. a) What are the different types of negative feedback ,explain how the input and output impedances of an amplifier are affected by the different types of negative feedback (8M)
- 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 (8M)
5. a) Write down the expression for frequency of oscillation in Hartley and Colpitts Oscillators (8M)
- 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 (8M)
6. a) What is meant by distortion in power amplifiers, explain the given different types of distortions (8M)
- b) With a neat sketch explain about push-pull amplifier (8M)
7. a) Draw the equivalent circuit of capacitance coupled single tuned amplifier and derive the equation for voltage gain (8M)
- b) Differentiate the single tuned and double tuned amplifiers (8M)

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SET - 3

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2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

PART -A

1. a) Derive the expression for output conductance of Hybrid $-\pi$ model (4M)
- 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. (4M)
- c) Compare negative feedback with the positive feedback (4M)
- d) State Barkhausen critetion for Oscillation (4M)
- e) What are the different types of distortion in amplifiers (3M)
- f) What is a tuned amplifier, what are the various types of tuned amplifiers (3M)

PART -B

2. a) Draw and Explain about the h-parameter definitions for Common Emitter transistor (8M)
- b) Determine the hybrid $-\pi$ parameters of a Transistor operating at Collector Current $I_C(Q)=2\text{mA}$, $V_{CE}(Q)=20\text{V}$ and $I_B(Q)=20\mu\text{A}$. Transistor specifications are $\beta_0=100$, unity gain frequency $f_T=50\text{MHz}$, $C_{OB}=3\text{pF}$, $h_{iE}=1.4\text{K}\Omega$, $h_{re}=2.5 \times 10^{-4}$, $h_{oe}=25\mu\text{mhos}$. Assume that the Operating temperature is 300°K . (8M)
3. 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 (16M)
4. a) What is meant by negative feedback in amplifier, enumerate the effects of negative feedback on the various characteristics of the amplifier (8M)
- b) An amplifier with $2.5\text{K}\Omega$ input resistance and $50\text{K}\Omega$ output resistance has a voltage gain of 100. The amplifier is now modified to provide 5% negative feedback in series with the input. Calculate (i) the voltage gain (ii) the input resistance and (iii) the output resistance with feedback (8M)
5. a) Draw the circuit diagram of Wein-bridge oscillator and explain its operation (8M)
- 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 (8M)
6. a) What is Class B amplifier, Derive the expression for efficiency (8M)
- b) If the ideal push-pull amplifier operates at maximum dissipation, show that its efficiency is 50% (8M)
7. Derive the expressions for 3dB bandwidth of (i) Capacitance coupled single tuned amplifiers (ii) Double tuned amplifiers (16M)

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1. a) Explain about validity of Hybrid $-\pi$ model (4M)
- b) What are DC amplifiers, mention a few applications of DC amplifiers (4M)
- c) An amplifier with stage gain 200 is provided with negative feedback of feedback ratio 0.005, find the new gain (4M)
- d) Explain the difference between an amplifier and an Oscillator (4M)
- e) What is the difference between crossover distortion and inter modulation distortion (3M)
- f) What is a stagger tuned amplifier (3M)

PART -B

2. a) Draw and Explain about the small signal high frequency equivalent circuit of a Transistor (8M)
- 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 (8M)
3. a) With a neat sketch explain about the cascade amplifiers (8M)
- b) A CE-RC coupled amplifier uses transistor with the following h-parameters: $h_{fe}=50$, $h_{oe}=30 \times 10^{-6}$ mhos, $h_{re}=2.5 \times 10^{-4}$. The value of g_m at the operating point is 50m mhos. The biasing resistor R_1 between V_{cc} and base is 100K Ω and R_2 between base and ground is 10K Ω . The load resistor $R_C = 5K\Omega$. let $C = 160$ pF be the total shunt capacitance in the input circuit and the coupling capacitor $C_c=6\mu$ F, Calculate for one stage of the amplifier (i) mid-band current gain (ii) mid-band voltage gain (8M)
4. a) Explain the method of identifying feedback Topology (8M)
- b) A voltage-series negative feedback amplifier has a voltage gain without feedback of A=500, input resistance $R_i=3K\Omega$, output resistance of $R_o=20K\Omega$ 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 (8M)
5. Explain the working of a (i) Miller Crystal Oscillator (16M)
- (ii) Pierce crystal oscillator
6. a) What is Class A amplifier, Derive the expression for maximum value of efficiency (8M)
- b) $V_{CE(max)}=15V$, $V_{CE(min)}=1V$, find the overall efficiency for (i) series -fed load (ii) transformer-coupled load (8M)
7. a) What is a Q-factor, Derive the expression for Q-factor of a capacitor (8M)
- b) Explain the effect of cascading single tuned amplifiers on Bandwidth (8M)