INSTITUTE OF AERONAUTICAL ENGINEERING

(AUTONOMUS)

Dundigal, Hyderabad - 500 043

ELECTRONICS AND COMMUNICATION ENGINEERING

TUTORIAL QUESTION BANK

Course Name	:	**ELETRONIC CIRCUIT ANALTSIS**
Course Code	:	A40412
Class	:	II - B. Tech 2nd Semester
Branch	:	Electronics and Communication Engineering
Year	:	2016 – 2017
Course Faculty	:	Mrs. Deepthi.S, Mrs. Ajitha .G, Mrs.Shruthi ,L, Mr. K Ravi

OBJECTIVES

To meet the challenge of ensuring excellence in engineering education, the issue of quality needs to be addressed, debated and taken forward in a systematic manner. Accreditation is the principal means of quality assurance in higher education. The major emphasis of accreditation process is to measure the outcomes of the program that is being accredited.

In line with this, Faculty of Institute of Aeronautical Engineering, Hyderabad has taken a lead in incorporating philosophy of outcome based education in the process of problem solving and career development. So, all students of the institute should understand the depth and approach of course to be taught through this question bank, which will enhance learner's learning process.

S. No	QUESTION	Blooms Taxonomy Level	Course Outcome
	UNIT-I **SINGLE STAGE & MULTISTAGE AMPLIFIERS**		
	Group - A (Short Answer Questions)		
1	List the classification of amplifiers.	Remember	1
2	List the classification of amplifiers based on frequency of operation	Remember	1
3	Define various hybrid parameters.	Remember	1
4	Draw the hybrid equivalent model of CE Amplifier	Understand	1
5	Reason out the causes and results of Phase	Understand	1
6	Reason out the causes and results of Frequency distortions in transistor amplifiers	Understand	1
7	Reason out the causes and results of Amplitude distortions in transistor amplifiers	Understand	1
8	Write the expressions for AV and Rin of a CE amplifier signals	Remember	1
9	Write the expressions for AV and Rin of a CB amplifier	Remember	1
10	Write the expressions for AV and Rin of a CC amplifier	Remember	1
11	t by small signal for analyzing a BJT based amplifier	Understand	1

S. No	QUESTION	Blooms Taxonomy Level	Course Outcome
12	State Miller's theorem. Specify its relevance in the analysis of a BJT amplifier.	Remember	1
13	Discuss various possibilities of inter-stage coupling of amplifiers.	Understand	1
14	Compute the overall lower cut-off frequency of an identical two stage cascade of amplifiers with individual lower cut-off frequency given as 432 Hz.	Evaluate	1
15	List out the special features of Darlington pair and cascode amplifiers. State the areas where these amplifiers are used?	Remember	1
16	What is non-linear distortion? List the causes for this type of distortion in amplifiers.	Remember	1
17	In a cascade amplifier, what is the coupling method which is capable of providing highest gain?	Remember	1
18	IF 5-stages of single tuned amplifier are cascaded with each circuit resonant frequency of 25KHz. Find the overall band width.	Evaluate	1
19	In a multistage amplifier, what is the coupling method required to amplify dc signals?	Remember	1
20	Write the expression for lower 3 – dB frequency of an n – stage amplifier with non – interacting stages.	Remember	1
21	Two stages of amplifier are connected in cascade. If the first stage has a decibel gain of 40 and second stage has an absolute gain of 20 then what is the overall gain in decibels.	Evaluate	1
22	Why the overall gain of multistage amplifier is less than the product of gains of individual stages.	Understand	1
23	What are the main characteristics of a Darlington amplifier?	Understand	1
24	Why direct coupling is not suitable for amplification of high frequency	Understand	1
	GROUP - II (LONG ANSWER QUESTIONS)		
1.	Analyze general transistor amplifier circuit using h parameter model. Derive the expressions for A_I, A_V, R_i, R_0, A_{Is}, A_{Vs}.	Analyze	1,8
2.	Draw the circuit of an emitter follower, and derive the expressions for AI, Av, Ri, R0 in terms of CE parameters.	Remember	1,8
3.	Write the analysis of a CE amplifier circuit using h parameters. Derive the expressions for A_I, A_V, R_i, R_0, A_{Is}, A_{Vs}.	Analyze	1,8
4.	Define h-parameter of a transistor in a small signal amplifier. What are the benefits of h-parameters?	Remember	1,8
5.	Draw the low frequency parameter equivalent circuit of a CE amplifier and explain the significance of each parameter.	Remember	1,8
6.	Draw hybrid-π equivalent of a transistor in CE configuration at low frequency. Discuss the significance of different parameters of the equivalent circuit.	Remember	1,8
7.	Analysis for CE amplifier with emitter resistance	Analyze	1,8
8.	Explain about different types of distortions that occur in amplifier circuits.	Understand	1,8
9.	Draw and explain the two stage amplifier with Darlington connection. Give the advantages of this circuit What are the drawbacks of a Darlington amplifier..	Remember	1,8
10.	Compare emitter follower and Darlington emitter follower configurations in respect of i. current gain ii. input impedance iii. voltage gain iv. output impedance.	Understand	1,8
11.	Compare the different types of coupling methods used in multistage amplifiers.	Remember	1,8

S. No	QUESTION	Blooms Taxonomy Level	Course Outcome
12.	Sketch two RC-coupled CE transistor stages. Show the middle and low frequency model for one stage. Write the expressions for current gains	Remember	1,8
13.	Draw the circuit diagram of cascode amplifier with and without biasing circuit. What is the advantages of this circuit	Remember	1,8
14.	Explain about different methods of Inter stage coupling in amplifiers. When 2-stages of identical amplifiers are cascaded, obtain the expressions for overall voltage gain, current gain and power gain	Understand	1,8
GROUP - III (ANALYTICAL QUESTIONS)			
1.	A CE amplifier is driven by voltage source with internal resistance R_s=800Ω.The load impedance R_L=2k Ω. The h-parameters are h_{ie}=1.1K,h_{re}=2.5*10^{-4},h_{fe}=50,h_{oe}=25μA/V. Compute A_I,A_V, A_{Is}, R_i, Z_o & A_p.	Evaluate	1,8
2.	A CB amplifier is driven by voltage source with internal resistance R_s=800Ω.The load impedance RL=2k Ω. The h-parameters are h_{ib}=22 Ω ,h_{rb}=3*10^{-4},h_{fb}=-0.98,h_{oe}=0.5μA/V. Compute A_I,A_V, A_{Is}, R_i, Z_o & A_p.	Evaluate	1,8
3.	A CC amplifier is driven by voltage source with internal resistance R_s=800Ω.The load impedance RL=2k Ω. The h-parameters are h_{ic}=1.1K Ω ,h_{rc}=1,h_{fc}=-51,h_{oc}=25μA/V. Compute A_I,A_V, A_{Is}, R_i, Z_o & A_p.	Evaluate	1,8
4.	A CE amplifier is driven by voltage source with internal resistance R_s=600Ω, RL=1200Ω. The h-parameters are h_{ie}=1.1K,h_{re}=2.5*10^{-4},h_{fe}=50,h_{oe}=25μA/V. Compute A_I,A_V, A_{Is}, R_i, Z_o & R_{ot} using (a)exact analysis (b) Approximate analysis	Evaluate	1,8
5.	Draw the circuit of CE amplifier. Draw it's equivalent circuit using Approximate model. Calculate A_I,A_V, R_i, Z_o & R_{ot} if R_s=1000Ω, RL=1200Ω. The h-parameters are h_{ie}=1.1K,h_{re}=2.5*10^{-4},h_{fe}=50,h_{oe}=24μA/V.	Evaluate	1,8
6.	Draw the circuit of CB amplifier. Draw it's equivalent circuit using Approximate model. Calculate A_I,A_V, R_i, Z_o & R_{ot} if R_s=900Ω, RL=2000Ω. The h-parameters are h_{ie}=1.1K,h_{re}=2.5*10^{-4},h_{fe}=50,h_{oe}=24μA/V.	Evaluate	1,8
7.	Draw the circuit of CC amplifier. Draw it's equivalent circuit using Approximate model. Calculate A_I,A_V, R_i, Z_o & R_{ot} if R_s=500Ω, RL=2000Ω. The h-parameters are h_{ie}=1.1K,h_{re}=2.6*10^{-4},h_{fe}=54,h_{oe}=26μA/V.	Evaluate	1,8
8.	A CE amplifier with emitter resistor R_E=800Ω , R_L=1k Ω. The h-parameters are h_{ie}=1.1K,h_{re}=5*10^{-4},h_{fe}=50,h_{oe}=25μA/V. Compute A_I,A_V, A_{Is}, R_i, R_{ot} . Use the Approximate model if permissible.	Evaluate	1,8
9.	Draw the circuit of CE amplifier with emitter resistor R_E. Draw it's equivalent circuit using Approximate model. Calculate A_I,A_V, R_i, Z_o & R_{ot} if R_s=600Ω, RL=1000Ω, R_E=800Ω. The h-parameters are h_{ie}=1.2K,h_{re}=3*10^{-4}, h_{fe}=50, h_{oe}=25μA/V.	Evaluate	1,8
10.	A CC amplifier with emitter resistor R_E=800Ω , Rc=400 Ω in the collector circuit. The h-parameters are h_{ie}=1.1K, h_{re}=2.4*10^{-4},h_{fe}=60,h_{oe}=25μA/V. Compute A_I,A_V, R_i . Use the Exact model.	Evaluate	1,8
11.	A Darlington emitter follower circuit uses two identical transistors having the following h-parameters h_{ie}=1.1K, h_{re}=2.5*10^{-4},h_{fe}=60,h_{oe}=20μA/V. R_E=2KΩ , R_S=500Ω Compute overall A_I & A_V, R_i, R_o & R_{ot} .	Evaluate	1,8
12.	A Darlington emitter follower circuit uses two identical transistors having the following h-parameters h_{ie}=1.1K, h_{re}=2.2*10^{-4},h_{fe}=50,h_{oe}=20μA/V. R_{E2}=3KΩ , R_S=400Ω, . R1=90KΩ , R2=10KΩ Compute overall A_I & A_V, R_i, R_o & R_{ot} .	Evaluate	1,8
13.	A CE-CC Amplifier uses R_S=1KΩ, . R_{C1}= R_{E2}=4KΩ . The h-parameters h_{ie}=1.2K, h_{re}=5*10^{-4},h_{fe}=50,h_{oe}=25μA/V, h_{ic}=1.2 Ω ,h_{rc}=1,h_{fc}=-51,h_{oc}=25μA/V. Compute individual & overall A_I & A_V, R_i, R_o & R_{ot} .	Evaluate	1,8
14.	A CE-CB (cascode) Amplifier uses R_S=1KΩ, . R_{C1}=25KΩ, R_E=100Ω , R3=200KΩ R4=10KΩ . The h-parameters h_{ie}=2K, h_{re}=0,h_{fe}=100,h_{oe}=0.	Evaluate	1,8

S. No	QUESTION	Blooms Taxonomy Level	Course Outcome
	Compute individual & overall A_I & A_V, R_i, R_i', R_o & R_{ot}.		
15.	A CE-CE(cascade) Amplifier uses R_S=1KΩ, . R_{C1}=15KΩ, R_{E1}=100Ω , R_{C2}=4KΩ , R_{E2}=330Ω,R1=200KΩ R2=10KΩ for the first stage,for second stage R1=47KΩ R2=4.7KΩ . The h-parameters h_{ie}=1.2K, h_{re}=2.5*10^{-4},h_{fe}=50,h_{oe}=25*10^{-6} A/V. Compute individual & overall A_I & A_V, R_i, R_i', R_o & R_{ot}.	Evaluate	1,8
	UNIT-II **BJT AMPLIFIERS-FREQUENCY RESPONSE**		
	Group - A (Short Answer Questions)		
1.	State how an emitter follower behaves at high frequencies.	Remember	2
2.	State how the hybrid – π parameters vary with respect to Ic.	Remember	2
3.	What is the relationship between f_T and f_β? Discuss the significance of f_T.	Understand	2
4.	Draw simplified high frequency model of CE amplifier.	Remember	2
5.	Write the hybrid – π conductance equations of common emitter transistor.	Remember	2
6.	How does g_m and Ce vary with |IC|, VCE and T.	Understand	2
7.	Define the gain bandwidth product of common emitter amplifier in terms of high frequency parameters	Remember	2
8.	Show that in Hybrid – π model, the diffusion capacitance is proportional to the emitter bias current.	Understand	2
9.	Define f_β fT and fα	Remember	2
10.	Write the expression for upper 3-dB frequency of a single stage CE amplifier in terms of input circuit time constant(τ_i)	Remember	2
11.	Define hybrid –π parameters	Remember	2
12.	What is the effect of coupling capacitor?	Understand	2
13.	What is the effect of bypass capacitor?	Understand	2
14.	Write down the expression for f_l and f_h of a CE amplifier considering the effects of bypass and coupling capacitors	Analyze	2
15.	Draw the frequency response of BJT amplifier.	Remember	2
16.	Write the general frequency considerations of an amplifier	Understand	2
17.	Define logarithm and dB	Remember	2
18.	Write the expression for current gain for a CE amplifier with o/p short circuit	Analyze	2
19.	Write the expression for current gain for a CE amplifier with resistive load	Analyze	2
20.	Draw the characteristics of MOSFET	Remember	6
21.	Define various regions of MOSFET characteristic curve	Remember	6
22.	Write the current equation for a MOSFET for various regions	Remember	6
23.	Define second order effects of a MOSFET	Remember	6
24.	Draw the small signal model of a MOSFET considering second order effects	Analyze	6
25.	Draw CS amplifier	Understand	6
26.	Draw the frequency response of CS amplifier with resistive load	Understand	6
	GROUP - II (LONG ANSWER QUESTIONS)		
1.	(a)Draw the small-signal equivalent circuit for an emitter follower stage at high frequencies and Obtain the voltage gain. (b) Derive the expressions for fβ and fT.	Understand Analyze	2,8
2.	(a) Explain why the 3-dB frequency for current gain is not the same as fH for voltage gain.	Understand	2,8

S. No	QUESTION	Blooms Taxonomy Level	Course Outcome
	(b) Derive the expression for the CE short-circuits current gain Ai with resistive load.	Analyze	
3.	Draw the hybrid-pi model, explain and derive the conductance and capacitances.	Remember, Analyze	2,8
4.	(a) Draw the hybrid-π equivalent of a CE transistor valid for high frequency and (b)Explain significance of each parameter.	Remember Understand	2,8
5.	(a) Derive the expression of gain bandwidth product for voltage. (b) Derive the expression of gain bandwidth product for current.	Analyze	2,8
6.	(a) Prove that (i) hfe=g_{m*} $r_{b'e}$ for a Hybrid -π model of CE amplifier. (b) How does a Ce and Cc vary with | Ic | and | VCE |. (c) How does gm vary with | Ic | and | VCE |, T	Analyze	2,8
7.	Draw the high frequency equivalent circuit of a BJT and explain the same.	Remember	2,8
8.	Give the typical values of various Hybrid- π parameters.	Remember	2,8
9.	Derive the expressions for Hybrid - π parameters., Ce, rbb', rb'e, Cc	Understand	2,8
10.	Derive the expression for the Hybrid - π t parameters gm, r_{ce}, Ce and rb'e, g_{ce}.	Understand	2,8
11.	Explain about Hybrid - π capacitances. How do Hybrid - π parameters vary with temperature	Analyze	2,8
12.	(a) Explain MOS small signal model. (b)Derive the expression for voltage gain of common source MOS amplifier with resistive load.	Analyze	6,8
13.	(a) Briefly, explain about I/V characteristics of a MOS transistor. (b) Explain and derive an expression for voltage gain of common source MOS amplifier with resistor load.	Understand Analyze	6,8
14.	Discuss about the second order effects of a MOS Transistor	Understand	6
	GROUP - III (ANALYTICAL QUESTIONS)		
1.	A CE amplifier with the load impedance R_L=2k Ω. The hybrid-π parameters are $r_{b'e}$=1K Ω,C_e=100pF,h_{fe}=50,C_C =3pF,g_m=50mS. Draw the high frequency hybrid-π circuit neglecting R_1, R_2, $r_{bb'}$. Calculate the time constants of output & input circuits & f_H & A_I at 100 KHz.	Evaluate	2,8
2.	At I_c=1mA & V_{CE}=10V a certain transistor has C_e= $C_{b'c}$=3pF and w_t=500Mrad/sec. Calculate $r_{b'e}$,C_e,g_m & w_β.	Evaluate	2,8
3.	Short circuit current gain of CE amplifier is 25 at frequency=2Mhz. If f_β=200Khz.Calculate f_T, h_{fe}, $\|A_I\|$ at frequency of 10Mhz & 100 Mhz.	Evaluate	2,8
4.	A high frequency CE amplifier with the R_s=0 calculate f_H if load impedance R_L=0k Ω & R_L=1k Ω. Assume typical hybrid-π parameters.	Evaluate	2,8
5.	A high frequency CE amplifier with the R_s=1K Ω calculate f_H ,A_{VSlow} and A_{VShigh} if load impedance R_L=0k Ω & R_L=1k Ω. Assume typical hybrid-π parameters.	Evaluate	2,8
6.	A CE amplifier is measured to have a bandwidth of 4Mhz with the R_L=600 Ω calculate R_s that will give the required bandwidth. Assume typical hybrid-π parameters $r_{bb'}$=100Ω , ,h_{fe}=100,C_C =2pF, g_m=50mS, f_T=300Mhz.	Evaluate	2,8
7.	A BJT has the following parameters measured at I_C=1mA, ,h_{ie}=3k , h_{fe}=100, C_C =2pF , C_e =18pF ,f_T=4Mhz. Find , $r_{bb'}$, $r_{b'e}$,g_m & f_H for R_L=1K Ω .	Evaluate	2,8
8.	The hybrid-π parameters are $r_{b'e}$=1K Ω, $r_{b'c}$=4M Ω, r_{ce}=80K Ω, $r_{bb'}$=100Ω,C_e=100pF h_{fe}=50,C_C =3pF,g_m=50mS. Find upper 3db frequency of current gain A_I, A_{VS}.	Evaluate	2,8
9.	For a single stage CE amplifier Find the value of R_s that will give 3db frequency f_H which is twice the value obtained with R_s=∞(ideal current source). $r_{b'e}$=1K Ω, C_e=100pF, h_{fe}=50, C_C =3pF, g_m=50mS, $r_{bb'}$=100 Ω.	Evaluate	2,8
10	The following low frequency parameters are given at 300^0K, I_c=10mA,	Evaluate	2,8

S. No	QUESTION	Blooms Taxonomy Level	Course Outcome
	V_{ce}=8V, h_{ie}=500 Ω , $h_{re}=10^{-4}$,h_{fe}=100,$h_{oe}=2*10^{-4}$A/V. Calculate the values of hybrid-π parameters.		
UNIT-III FEEDBACK AMPLIFIERS & OSCILLATORS			
Group - A (Short Answer Questions)			
1.	What is feedback and what are feedback amplifiers	Remember	3
2.	What is meant by positive and negative feedback	Remember	3
3.	What are the advantages and disadvantages of negative feedback	Understand	3
4.	Differentiate between voltage and current feedback in amplifiers	Understand	3
5.	Define sensitivity	Remember	3
6.	Define De-sensitivity	Remember	3
7.	What are the conditions for sustained oscillator or what is Barkhausen criterion	Remember	3
8.	What is Oscillator circuit	Understand	4
9.	What are the classifications of Oscillators	Understand	4
10.	What are the types of feedback oscillators	Understand	4
11.	Define Piezo-electric effect	Remember	4
12.	Draw the equivalent circuit of crystal oscillator	Understand	4
13.	What is Miller crystal oscillator? Explain its operation	Remember	4
14.	State the frequency for RC phase shift oscillator	Remember	4
15.	Give the topology of current amplifier with current shunt feedback	Remember	3
16.	What are gain margin and phase margin	Remember	3
17.	What is the minimum value of h_{fe} for the oscillations in transistorized RC Phase shift oscillator	Remember	4
18.	What is LC oscillator	Remember	4
19.	Draw the circuit of Clapp oscillator	Remember	4
20.	How does an oscillator differ from an amplifier	Understand	4
21.	Name two low frequency oscillators	Remember	4
22.	Calculate the frequency of oscillation for the Clapp oscillator with c1=0.1µf, c2=1µf, c3=100pF and L=470µH	Evaluate	4
GROUP - II (LONG ANSWER QUESTIONS)			
1.	Explain the concept of feedback as applied to electronic amplifier circuits. What are the advantages and disadvantages of positive and negative feedback	Understand	3,8
2.	With the help of a general block schematic diagram explain the term feedback	Understand	3,8
3.	What type of feedback is used in electronic amplifiers? What are the advantages of this type of feedback. Prove each one mathematically.	Understand	3,8
4.	Give the equivalent circuits, and characteristics of ideal and practical amplifiers of the following types (i) Voltage amplifier, (ii) Current amplifiers, (i i i) Trans-resistance amplifier, (iv) Trans-conductance amplifier.	Understand	3,8
5.	Derive the expression for the input resistance with feedback R_{if} and output resistance with feedback R_{Of} in the case of (a) Voltage series feedback amplifier. (b) Voltage shunt feedback amplifier. (c) Current series feedback amplifier. (d) Current shunt feedback amplifier	Analyze	3,8
6.	In which type of amplifier the input impedance increases and the output impedance decreases with negative impedance? Prove the same drawing equivalent circuit.	Analyze	3,8
7.	Draw the circuit for Voltage series amplifier and justify the type of feedback.	Analyze	3,8

S. No	QUESTION	Blooms Taxonomy Level	Course Outcome
	Derive the expressions for Av, Ri and Ro for the circuit.		
8.	Draw the circuit for Current series amplifier and justify the type of feedback. Derive the expressions for Av, Ri and Ro for the circuit.	Analyze	3,8
9.	Draw the circuit for Voltage shunt amplifier and justify the type of feedback. Derive the expressions for Av, Ri and Ro for the circuit.	Analyze	3,8
10.	Draw the circuit for Current shunt amplifier and justify the type of feedback. Derive the expressions for Av, Ri and Ro for the circuit.	Analyze	3,8
11.	Explain the basic principle of generation of oscillations in LC tank circuits. What are the considerations to be made in the case of practical L.C. Oscillator Circuits?	Understand	3,8
12.	Deduce the Barkausen Criterion for the generation of sustained oscillations. How are the oscillations initiated?	Understand	3,8
13.	Draw the circuit and explain the principle of operation of RC phase-shift oscillator circuit. What is the frequency range of generation of oscillations? Derive the expression for the frequency of oscillations.	Analyze	4,8
14.	Derive the expression for the frequency of Hartely oscillators	Analyze	4,8
15.	Derive the expression for the frequency of Colpitt Oscillators.	Analyze	4,8
16.	Derive the expression for the frequency of Wein Bridge Oscillators.	Analyze	4,8
17.	Derive the expression for the frequency of Crystal Oscillators	Analyze	4,8
18.	Explain how better frequency stability is obtained in crystal oscillator?	Analyze	4,8
19.	Draw the equivalent circuit for a crystal and explain how oscillations can be generated in electronic circuits, using crystals.	Analyze	4,8
20.	Reason out the need for three identical R-C sections in R-C phase-shift oscillator circuits?	Understand	4,8
GROUP - III (ANALYTICAL QUESTIONS)			
1.	The following information is available for the generalized feedback network. Open loop voltage amplification (A_V) = - 100. Input voltage to the system (V,') = 1mV. Determine the closed loop voltage amplification, the output voltage, feedback voltage, input voltage to the amplifier, and type of feed back for (a) $\beta = 0.01$, (b) $\beta = -0.005$ (c) $\beta = 0$ (d) $\beta = 0.01$. Also determine the % variation in Avl resulting from 100 % increase in A, when $\beta_v = 0.01$. When $A_v = -100$ $A_v' = -50$.	Evaluate	3,8
2.	An amplifier has a mid band gain of 125 and bandwidth of 250 kHz. If 4% negative feedback is introduced, find the new bandwidth and gain.	Evaluate	3,8
3.	An amplifier with open loop voltage gain $A_v = 1000 \pm 100$ is available. It is necessary to have an amplifier where voltage gain varies by not more than ± 0.1 % (a) Find the reverse transmission factor β of the feedback network used. (b) Find the gain with feedback.	Evaluate	3,8
4.	An amplifier with Av = - 500, produces 5% harmonic distortion at full output. What value of β is required to reduce the distortion to 0.1 % ? What is the overall gain?	Evaluate	3,8
5.	For a voltage series feedback amplifier Find D,A_{vf},R_{if},R_{of}'.	Evaluate	3,8

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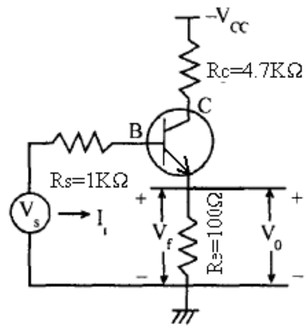
<tr><th>S. No</th><th>QUESTION</th><th>Blooms Taxonomy Level</th><th>Course Outcome</th></tr>
<tr><td></td><td>
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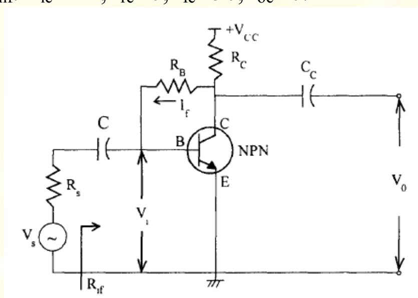
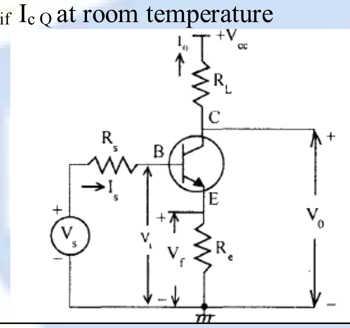
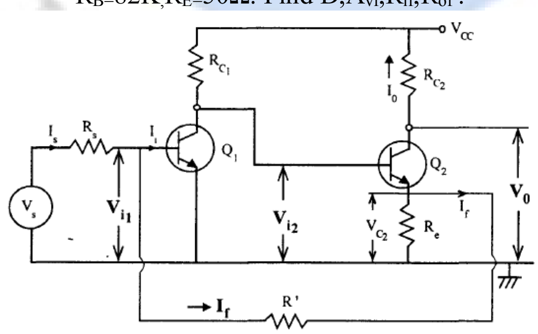
<tr><td>6.</td><td>For a voltage shunt feedback amplifier R_s=8K,R_c=3K, R_B=30K,. Find D,A_{vf},R_{if},R_{of}',R_{mf}. h_{ie}=1K,h_{re}=0,h_{fe}=50,h_{oe}=0.

</td><td>Evaluate</td><td>3,8</td></tr>
<tr><td>7.</td><td>For a current series feedback amplifier R_s=1K, g_{mf}=-2mA/V. A_{vf}=-8 D=60 h_{fe}=300. Find R_e R_L R_{if} $I_{c\,Q}$ at room temperature

</td><td>Evaluate</td><td>3,8</td></tr>
<tr><td>8.</td><td>For a current shunt feedback amplifier R_s=R'=1K,R_{c1}=2.5K, R_{c2}=600 Ω, R_B=82K,R_E=50Ω. Find D,A_{vf},R_{if},R_{of}'.

</td><td>Evaluate</td><td>3,8</td></tr>
<tr><td>9.</td><td>(a) State three fundamental assumptions which are made in order that the expression Af =A/(1+Aβ) be satisfied exactly.
(b) An Amplifier has a value of Rin=4.2K, AV =220 and β=0.01. Determine the value of input resistance of the feedback amplifier.
(c) The amplifier in part (a) had cut-off frequencies f1=1.5KHz and f2=501.5KHz before the feedback path was added. What are the new cut-off</td><td>Evaluate</td><td>3,8</td></tr>
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S. No	QUESTION	Blooms Taxonomy Level	Course Outcome
	frequencies for the circuit?		
10	The gain of an amplifier is decreased to 10,000 with negative feedback from its gain of 60,000. Calculate the feedback factor .Express the amount of negative feedback in dB.	Evaluate	3,8
11	Calculate the gain, input impedance, output impedance of voltage series feedback amplifier having A=300, Ri=1.5K,RO=50K and β =1/12.	Evaluate	3,8
12	An amplifier has mid-band gain of 125 and a bandwidth of 250KHz. i. If 4% negative feedback is introduced, find the new bandwidth and gain ii. If bandwidth is restricted to 1MHz, find the feed back ratio.	Evaluate	3,8
13	. An Amplifier has a mid-frequency gain of 100 and a bandwidth of 200KHz. i. What will be the new bandwidth and gain if 5% negative feedback is introduced? ii. What should be the amount of negative feedback if the bandwidth is to be restricted to 1MHz?	Evaluate	3,8
14	An RC coupled amplifier has a voltage gain of 1000. f1=50Hz, f2=200KHz and a distortion of 5% without feedback. Find the amplifier voltage gain,f1', f2' and distortion when a negative feedback is applied with feedback ratio of 0.01.	Evaluate	3,8
15	A Hartley oscillator is designed with L = 20μH and a variable capacitance. Find the Range of capacitance values if the frequency of oscillation is varied between 950 KHz to 2050 KHz.	Evaluate	4,8
16	In a transistorized Hartley oscillator the two inductances are 2mH and 20μH while the frequency is to be changed from 950KHZ to 2050KHZ. Calculate the range over which the capacitor is to be varied.	Evaluate	4,8
17	A crystal has L=2H, C=0.01PF and R=2k. Its mounting capacitance is 2PF. Calculate its series and parallel resonating frequency.	Evaluate	4,8
18	Find the capacitor C and hfe for the transistor to provide a resonating frequency of 10KHZ of a phase-shift oscillator. Assume R1=25k, R2=60k,Rc=40k, R=7.1k and hie=1.8k.	Evaluate	4,8
19	A crystal has L=0.1H, C=0.01PF, R=10k and CM=1PF. Find the series resonance and Q-factor.	Evaluate	4,8
20	A quartz crystal has the following constants. L=50mH, C1=0.02PF, R=500 and C2=12PF. Find the values of series and parallel resonant frequencies. If the external capacitance across the crystal changes from 5PF to 6PF, find the change in frequency of oscillations	Evaluate	4,8
	UNIT-IV LARGE SIGNAL AMPLIFIERS		
	Group - A (Short Answer Questions)		
1.	Classify large signal amplifiers based on its operating point. Distinguish these amplifiers in terms of the conversion efficiency.	Understand	5
2.	What is the origin of crossover distortion and how it can be eliminated?	Understand	5
3.	Derive the expression for the output current in push -pull amplifier with base current as $i_b = I_{bm}\sin wt$	Analyze	5
4.	Differentiate power amplifier with that of a normal small signal amplifier in the aspects of its construction and applications	Analyze	5
5.	What are the drawbacks of transformer coupled power amplifiers?	Understand	5
6.	What is the origin of crossover distortion and how it can be eliminated?	Understand	5
7.	State the need of a heat sink for large signal amplifier and state what is a thermal resistance?	Understand	5
8.	Define the terms collector dissipation and conversion efficiency of class A power amplifier.	Remember	5

S. No	QUESTION	Blooms Taxonomy Level	Course Outcome
9.	In a modified class B power amplifier cross over, how distortion can be eliminated.	Understand	5
10.	Prove that in class A power amplifier if distortion is 10%. power at the load is increased by 1%.	Understand	5
11.	State the advantages of push pull class B power amplifier over class B power amplifier.	Understand	5
12.	Calculate the power that can be dissipated by a transistor at an ambient temperature of T_A=500C, given T_j=2300C and θ_{JA}=1000C/W.	Evaluate	5
13.	The thermal resistance of a transistor is 100C/W. It is operated at TA=250C and dissipates 3W of power. Calculate the junction temperature.	Evaluate	5
14.	Compare various power amplifiers with respect to conduction angle, efficiency and distortion.	Understand	5
15.	What is a harmonic distortion? How even harmonics is eliminated using push-pull circuit?	Remember	5
16.	List the advantages of complementary-symmetry configuration over push pull configuration.	Remember	5
17.	State different types of heat sinks.	Remember	5
18.	State the features of class AB power amplifier like operating point, conduction angle and power dissipation.	Remember	5
19.	If the dissipated power at the junction is 10W, and the junction capacitance is 1250C and TA=250C then find thermal resistance between junction to ambient.	Evaluate	5
20.	Define conversion efficiency of power amplifier.	Remember	5
21.	As the temperature increases, what will happen to the base –emitter voltage of a given Transistor	Remember	5
22.	For a class B amplifier $V_{CE(MIN)}$ =2V,V_{CC} = 15V. Find its overall efficiency.	Evaluate	5
23.	Explain how distortion is reduced in class AB push-pull topology.	Analyze	5
24.	What are the two primary metrics used to describe the performance of a large signal amplifier	Understand	5
25.	Define the parameters exhibited by a Class AB power amplifier.	Remember	5
26.	How is phase splitting achieved in push-pull topologies that do not use transformers?	Understand	5
27.	What is thermal runaway? Show how it can be avoided	Understand	5
28.	Why the conversion efficiency in a transformer coupled amplifier double that of the RC coupled class A amplifier?	Analyze	5
	GROUP - II (LONG ANSWER QUESTIONS)		
1.	What are the different methods of clarifying electronic amplifiers? How are they classified, based on the type of coupling? Explain.	Understand	5,8
2.	Compare the characteristic features of Direct coupled, resistive capacitor coupled, and Transformer coupled amplifiers.	Understand	5,8
3.	Distinguish between small signal and large signal amplifiers. How are the power amplifiers classified? Describe their characteristics.	Understand	5,8
4.	Derive the general expression for the output power in the case of a class A power amplifier. Draw the circuit and explain the movement of operating point on the load line for a given input signal.	Analyze	5,8
5.	Derive the expressions for maximum. Theoretical efficiency 'for (i) Transformer coupled (ii) Serves fed amplifier what are their advantages and disadvantages.	Analyze	5,8
6.	Show that in the case of a class A transforms coupled amplifier, with impedance matching, the expression for voltage gain AV is given as	Analyze	5,8

S. No	QUESTION	Blooms Taxonomy Level	Course Outcome
	$A_V = -\left(\frac{h_{fe}}{2}\right) \cdot \frac{R_L}{h_{ie}} \cdot \frac{N_1}{N_2}$		
7.	List out the advantages and disadvantages of transformer coupling?	Remember	5,8
8.	Show that class B push pull amplifiers exhibit half wave symmetry.	Understand	5,8
9.	Derive the expression for Max. Theoretical efficiency in the case of class B push pull amplifier. Why is it named so ? What are its advantages and disadvantages?	Analyze	5,8
10.	Explain about heat sinks. Explain the term Thermal Resistance. Give the sketches of heat sinks.	Analyze	5,8
11.	(a) If two transistors are employed in a push-pull amplifier with cut-off bias, orin Class-B operation of the amplifier, explain the process of generation of 'crossover distortion' with necessary diagrams and the reasons behind such phenomenon. (b) Suggest a suitable circuit for minimizing the above distortion.	Analyze	5,8
	GROUP - III (ANALYTICAL QUESTIONS)		
1.	A power amplifier supplies 3w to a load of 6K. The zero signal d.c collector current in 55 mA and the collector current with signal in 60mA. How much is the percentage in second harmonic distortion	Evaluate	5,8
2.	A class B, push pull amplifier drives a load on 16, connected to the secondary of the ideal transformer. The supply voltage in 25V. If the turns on the primary in 200 and the No. of turn the secondary in 50, Calculate maximum power o/p, d.c power input, efficiency and maximum power dissipation per transistor.	Evaluate	5,8
3.	In a class B complementary power amplifier Vcc=+15V, -Vcc=15V and RL=4Ω. Calculate i. maximum a.c power which can be developed ii. collector dissipation while developing maximum a.c power iii. efficiency iv. maximum power dissipation per transistor	Evaluate	5,8
4.	A series fed class A amplifier uses a supply voltage of 10V and load resistance of 20 Ω. The a.c input voltage results in a base current of 4mA peak. Calculate i. d.c input power ii. a.c output power iii. %efficiency	Evaluate	5,8
5.	What is the Junction to ambient Thermal Resistance for a device dissipating 600 mw into an ambient temperature of 500C and operating at a junction temperature of 1100C?	Evaluate	5,8
6.	Calculate the transformer turns ratio required to match a 8 Ω speaker load to an amplifier so that the effective load resistance is 3.2 K Ω	Evaluate	5,8
7.	In complementary - symmetry class-B power amplifier circuit, VCC=25 Volts, RL=16 and Imax=2 Amps. Determine the input power, output power and efficiency.	Evaluate	5,8
8.	What is the junction to ambient thermal resistance for a device dissipating 600 m W into an ambient of 60°C and operating at a junction temperature of 120°C.	Evaluate	5,8
9.	Design a class A power amplifier to deliver 5V rms to a load of 8 Ohms using a transformer coupling. Assume that a supply of 12V is available. The resistance of the primary winding of the transformer also should be considered.	Evaluate	5,8
10	Design a class A transformer coupled amplifier, using the transistor, to	Evaluate	5,8

S. No	QUESTION	Blooms Taxonomy Level	Course Outcome
	deliver 75 m W of audio power into a 40 load. At the operating point, IB = 250 µA, V cc = 16V. The collector dissipation should not exceed 250 m W. RL' = 900 Ω. Make reasonable approximations wherever necessary.		
11	Design a class B power amplifier to deliver 30W to a load resistor R_L = 40 Ω using a transformer coupling. V m = 30V = V_{cc}. Assume reasonable data wherever necessary.	Evaluate	5,8
12	The amplifier shown is made up of an NPN and PNP transistors. The h-parameters of the two transistors are identical and are given as h_{ie}=1K, h_{re}=0, h_{fe}=100,h_{oe}=0. Find overall voltage gain Av = V_O/ V_i	Evaluate	5,8
UNIT-V TUNED AMPLIFIERS			
Group - A (Short Answer Questions)			
1.	Mention the salient features of tuned amplifiers.	Remember	7
2.	List out the applications of tuned amplifier.	Remember	7
3.	Give the reason for using two tuned circuits are used in double tuned amplifier	Understand	7
4.	Discuss the necessity of stabilization circuits in tuned amplifiers.	Understand	7
5.	Define the expression for effective bandwidth of cascaded tuned amplifier.	Remember	7
6.	Classify tuned amplifier based on the input signal applied, no of tank circuits and based on coupling	Understand	7
7.	Give the reas parallel resonance circuits are used in tuned amplifiers	Understand	7
8.	Write the expression for voltage gain for a capacitive coupled single tuned amplifier and also gain at resonance	Remember	7
9.	Why transformer coupling is not used in the initial stage of a multistage amplifier	Understand	7
10.	Define a tuned amplifier. State how its frequency response is different from a normal small signal BJT amplifier.	Understand	7
11.	What happen when number of stages is increased in single tuned cascaded amplifiers?	Understand	7
12.	Compare and contrast single tuned and double tuned amplifier in all the aspects.	Evaluate	7
13.	Draw the circuit diagram matched capacitively coupled single tuned amplifier	Evaluate	7
14.	What is the impact of the coupling elements on the frequency response?	Understand	7
15.	State which are the areas in the field of electronics that uses the tuned amplifiers	Remember	7
16.	Give the gain and 3dB frequencies equation of single tuned amplifier.	Remember	7
17.	Draw ideal and actual frequency response curves of single-tuned Amplifier	Remember	7
18.	Draw the circuit of tapped single tuned capacitively coupled amplifier and given the equation	Remember	7
19.	List out the advantages and disadvantages of tuned amplifier.	Evaluate	7
20.	A parallel resonant circuit consists of a capacitor of 100pF and an inductor of 100µH with its internal resistance of 5Ω. Find the resonant frequency and impedance at resonant.	Remember	7
21.	List out the applications of tuned amplifier	Remember	7
22.	For a parallel tuned circuit, define the resonant frequency, impedance at resonance and Quality factor.	Evaluate	7
23.	The band width for double tuned amplifier is 10 kHz. Calculate the band width if 3 such stages are cascaded. Also calculate the bandwidth for 4 stages	Analyze	7
24.	Classify tuned amplifier based on the input signal applied, no of tank circuits	Understand	7

S. No	QUESTION	Blooms Taxonomy Level	Course Outcome
	and based on coupling.		
25.	Why cascaded amplifiers are preferred for tuned amplifiers	Remember	7
26.	Why do the receiver circuits need a tuned amplifier	Understand	7
GROUP - II (LONG ANSWER QUESTIONS)			
1	(a) Draw the circuit diagram of a tuned primary amplifier. Derive expression for its voltage gain at resonance and bandwidth. (b) Differentiate between single tuned and double tuned amplifiers.	Analyze	7,8
2	(a) Derive the expression for quality factor of a single tuned inductively Coupled amplifier. (b) Derive the expression for current gain to the tapped tuned circuit	Understand	7,8
3	a) List possible configurations of tuned amplifiers. b) Draw and explain the circuit diagram of a single tuned capacitance coupled amplifier. Explain its operation.	Apply	7,8
4	Derive the expressions for Bandwidth and Q-factor of single tuned, capacitive coupled amplifiers. List the assumptions made for the derivation	Understand	7,8
5	Draw the circuit of double tuned transformer coupled amplifier and the working of it in detail and Discuss the nature of response of the amplifier for different values of KQ = 1, KQ > 1 and KQ < 1.	Analyze	7,8
6	Draw the circuit diagram of a tapped single tuned capacitive coupled amplifier and explain its operation and derive A/A_{res} and plot the frequency response of it.	Analyze	7,8
7	Using the circuit diagram and equivalent circuit of inductively coupled single stage tuned amplifier. Derive expressions bandwidth which interrelated to the circuit component values and quality factor of the tuned circuit and resonant frequency.	Understand	7,8
GROUP - III (ANALYTICAL QUESTIONS)			
1	In a tuned amplifier circuit C=500PF, L=20μH, RL=1.5K and the transistor has hfe=50 and input resistance of 200 . The coil used has Q factor=30. Calculate i. resonant frequency of the tuned circuit ii. impedance of the tuned circuit iii. Voltage gain of the stage.	Evaluate	7,8
2	A single tuned transistor amplifier is used to amplifier modulated RF carrier of 500 KHz and bandwidth of 20KHz. The circuit has a total output resistance Rt=40K and output capacitance Co=50PF. Calculate values of inductance and capacitance of the tuned circuit.	Evaluate	7,8
3	In a tuned amplifier circuit C=400PF, L=30μH RL=1.5K and the transistor has hfe=60 and input resistance of 200. The coil used has Q factor = 30. Calculate i. fr of the tuned circuit ii. impedance of the tuned circuit iii. voltage gain of the stage.	Evaluate	7,8

Prepared By: Mrs. Deepthi.S, Mrs. Ajitha .G, Mrs. Shruthi .L, Mr. K Ravi

HOD, ECE