BITS-Pilani Dubai,
Dubai International Academic City, Dubai
I Semester, Academic Year 2008-09

Evaluation Component : **TEST-I (Closed Book)**

EEE C424 / INSTR U313 MICROELECTRONIC CIRCUITS

Date : 5th Oct. 2008
Duration: 50 mts

Max. Marks: 25
Weightage: 25%

Note:- 1. ANSWER ALL QUESTIONS
2. Make assumptions, if any, but explicitly indicate the assumptions made

- - -

1)

a) Define the following terms with reference to a General Purpose Amplifier:

(i) Voltage Gain

(ii) Bandwidth

(iii) Amplifier saturation

(iv) Maximum signal handling capacity

(v) Efficiency

(5.0 M)

b) List any four important considerations in choosing the BIAS POINT while designing of a BJT Amplifier

(2.0 M)

2)

a) Draw the h-parameter model of a BJT and define all the four parameters. Also indicate how they can be obtained from the characteristics of the active device. (3.0 M)

b) List the five important steps in performing ac analysis of a BJT Amplifier (3.0 M)

3) A BJT Common Emitter Amplifier with R_C=10 kΩ is connected between a source with R_s=5 kΩ, and a load of R_L=5 kΩ. Assuming that the parameters of the BJT model are: r_π=2.5 kΩ, g_m=40mA/V, r_0=100 kΩ,

a) Derive an expression for overall voltage gain

b) Find the magnitude of overall voltage gain.

c) Recalculate the magnitude of overall voltage gain neglecting r_o

d) Find short circuit current gain

(6.0 M)

4) Derive an expression for magnitude response of Single Time Constant which do not attenuate low frequency components of the signal fed to its input and deduce an expression for its 3-dB cut-off frequency.

[6.0 M]

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BITS-Pilani Dubai,
Dubai International Academic City, Dubai
I Semester, Academic Year 2008-09

Evaluation Component : TEST-II (Open Book)

EEE C424 / INSTR U313 MICROELECTRONIC CIRCUITS

Date : 16th Nov. 2008
Duration: 50 mts

Max. Marks: 20
Weightage: 20%

Note:- 1. ANSWER ALL QUESTIONS.
2. Make assumptions, if any, but explicitly indicate the assumptions made.
3. Only the Prescribed Text: Microelectronic Circuits by Sedra / Smith allowed.

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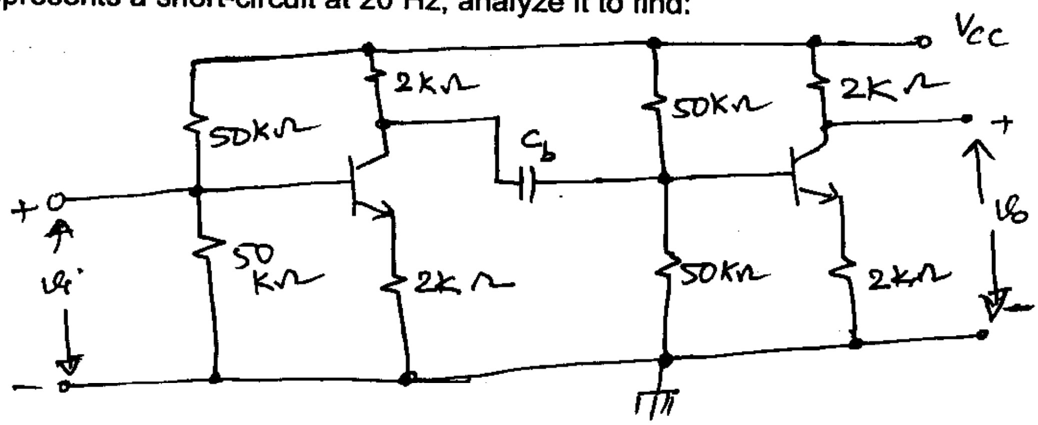
1) Assuming that (i) transistors are identical with its h-parameter model parameters for each transistor: $h_{fe}=50$, $h_{ie}=1.1K\Omega$, $h_{re} = h_{oe}=0$ and (ii)C_z, in the cascaded stage shown below represents a short-circuit at 20 Hz, analyze it to find:



a) The mid band gain (2.0

b) The value of the C_b necessary to give a lower 3-dB frequency of 20 Hz. (3.0 M)

2)

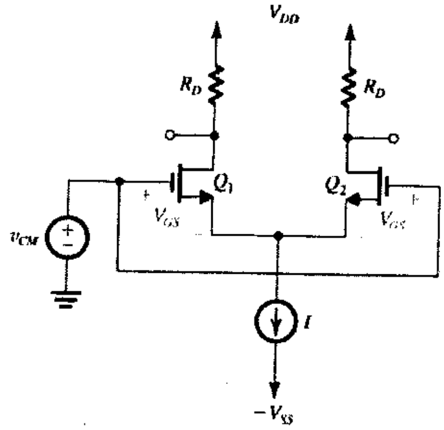
a) Sketch the idealized bode amplitude and phase plots for if an amplifier's transfer function has one zero at f_z and one pole at f_p if (i) $f_p < f_z$ and (ii) $f_p > f_z$. (2.0 M)

b) An amplifier with open-loop voltage gain Av = 1,000 ± 100 is available. It is necessary to have an amplifier whose voltage gain varies by no more than ± 0.1 %. Find (i)the reverse transmission factor, b of the feedback network used and (ii)gain of this amplifier with feedback. (2.0 M)

c) Starting from fundamentals derive an expression for the output voltage of the differential amplifier block shown below in terms of its CMRR(ρ), differential mode (A_d) and common mode gain (A_c). (2.0 M)

(Please Turn Over)

3) For the MOS differential pair, shown below, a common mode voltage v_{CM} is applied. Assume V_{DD} = V_{SS}=1.5 V; $k'_n(W/L)$=4 mA/V^2; V_t = 0.5V; I = 0.4 mA and R_D= 2.5kΩ. Neglect channel length modulation:



a) Find v_{OV} and V_{GS} for each transistor (2.0 M)

b) For v_{CM}=0,find i_{D1},i_{D2},v_{D1},v_{D2} (2.0 M)

c) What is the highest value of v_{CM},for which Q_1 and Q_2 remain in saturation (2.0 M)

4) A series-series feedback amplifier employs a basic amplifier with input and output resistances each of 1kΩ and gain A=2000 V/V. The feedback factor β=0.1 V/V. Find the gain, A_f ;.the input resistance, R_{if} ; and the output resistance, R_{of} (3.0 M)

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ID No: Name Date

BITS-Pilani Dubai, International Academic City, Dubai

III YEAR EEE Evaluation Component : **QUIZ-1**

INSTR C 313 MICROELECTRONIC CIRCUIT DESIGN

Max. Marks: 20 **Duration: 20 mts** **Weightage: 5%**

1. BJT is a ___________ polar device [1]
2. State the reason for power dissipation in amplifier (1)
3. The operating point is established by____________ (1)
4. The gain of buffer amplifier__________________ (1)
5. The ideal characteristics for transconductance amplifier are $R_i=\infty$ and R_o-∞.Justify them (1)
6. Write the condition required for the cutoff frequency in RC filter (1)
7. Write doping relation among base, emitter and collector of a transistor. (1)
8. Why silicon is preferred for manufacturing semiconductor devices (1)
9. Small signal amplifier is operated in ________region. (1)
10. If α=0.9 for a transistor, find the value of base current if the emitter current is 25mA (1)
11. A BJT having β=100 is biased at a dc collector current of 1mA.Find the value of g_m . (1)
12. A BJT having β=100 is biased at a dc collector current of 1mA.Find the value of r_e. (1)

PTO

ID No: Name Date

13. A BJT having β=100 is biased at a dc collector current of 1mA.Find the value of r_π. (1)

14. Draw the equivalent circuit of current amplifier (1)

15. Draw hybrid model of Voltage amplifier (1)

16. Derive the expression for gain in decibel in terms of current or voltage (1)

17. Write the classification of amplifier with respect to its configuration followed for its connection in the circuit. [1]

18. The value of current gain of CB amplifier is__________ [1]

19. Draw hybrid π-model circuit for PNP transistor. [1]

20. The advantage of multi stage amplifier is to have ____________ gain [1]

ID No: Name Date

BITS-Pilani Dubai, International Academic City, Dubai
III YEAR EEE Evaluation Component : **QUIZ-2**
INSTR C 313 MICROELECTRONIC CIRCUIT DESIGN

Max. Marks: 20 **Duration: 20 mts** **Weightage: 5%**

1. Define differential amplifier [1]
2. write the advantages of differential amplifier (2)
3. Write the various mode of operation of differential amplifier (2)
4. Define CMRR of differential amplifier (1)
5. Write the factors affecting CMRR of differential amplifier (2)
6. The value of CMRR for an ideal differential amplifier is ____________ (1)
7. If constant DC bias current is I=2mA and the overdrive voltage Vov=1 V in the differential amplifier, then the value of gm is ______________ (1)
8. The differential gain of differential amplifier with above specifications is ______,if the drain resistance is 1kohm (1)
9. The range of input voltage for differential amplifier to operate in differential mode is ____________if the overdrive voltage is 2V (1)

ID No: Name Date

10. At lower frequency, the frequency response of amplifier is __________filter due to

____________ capacitances. (2)

11. At higher frequency, the frequency response of amplifier is __________filter due to

____________ capacitances. (2)

12. What is miller effect (2)

13. What is miller multiplier (1)

14. The gain bandwidth product gives the ______________ of amplifier (1)

Student Name:____________________ BITS ID No.: ______________

BITS-Pilani Dubai, International Academic City, Dubai

I – Semester Academic Year 2008-09

Evaluation Component : **QUIZ - II**

INSTR UC 313 MICROELECTRONIC CIRCUITS

Date : 29th October 2008
Duration: 15 mts.

Maximum Marks:
Weightage : 5 %

Note:- 1.Respond ALL questions
2. Fill the blanks, show the working and / or indicate the "**most appropriate answer**" or "**most appropriate combination of Answers**" as required for each question.
2.Make your assumptions, if any, explicit
3.All questions carry 1 mark unless otherwise indicated

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1. Identify the following signals (as either voltage or current) of the generalized signal flow diagram of a Shunt-Series feedback amplifier

Input signal, X_i	Output Signal, X_o	Fedback Signal, X_f	Sampled Signal, X_s

2. Upon Application of Shunt-Shunt feedback to an open loop Amplifier, its input resistance will ____________________ (increase / decrease / remain unchanged) (0.5Mark)
3. Match the following configuration of feedback shown under I with the corresponding pair of the way "mixing and sampling" is accomplished as given under II ...by indicating the serial no. of I in the braces: "[ ]" of II.

I	II
A. Series Series	current mixing and current sampling [ ]
B. Shunt Series	current mixing and voltage sampling [ ]
C. Shunt Shunt	voltage mixing and current sampling [ ]
D. Series Shunt	voltage mixing and voltage sampling [ ]

4. In determining the loop gain $A\beta$ through an approach in which conceptual feed back loop is broken and a test signal (as appropriate) is applied, express $A\beta$ in terms of Open & Short circuit transfer functions (T_{oc} & T_{sc} respectively) and also provide expressions to find T_{oc} and T_{sc}. (2 Marks)

$A\beta =$; $T_{sc} =$; $T_{oc} =$ where in

____ is ____________________ ; ____ is ____________________ ;

____ is ____________________ ; ____ is ____________________

5. If the two poles of a feedback amplifier are on the imaginary axis and are complex in nature then they occur as a ______________ pair and the amplifier is said to have ______________________ response
6. The Phase margin is __________ degrees minus ______________ at the frequency at which __________ is unity.
7. From the general rule of thumb in ensuring Feedback amplifier's stability, at the intersection of 20log [1 / $|\beta(j\omega)|$] and 20log $|A(j\omega)|$ the ____________________ should not exceed 20 dB / decade.

ID No: Name Date

BITS-Pilani Dubai, International Academic City, Dubai
III YEAR EEE Evaluation Component : QUIZ-3
EEE C 424 MICROELECTRONIC CIRCUITS

Max. Marks: 20 **Duration: 20 mts** **Weightage: 5%**

1. Write the reason for selecting active filter. [1]

2. Write the reason choosing inductor less filter. [1]

3. Write the conditioned required for the BPF filter being formed by LPF followed by HPF in series connection . [1]

4. The LPF and the HPF are connected in parallel with a condition that cutoff frequency of LPF is greater than cutoff frequency HPF. What is the kind of filter this connection formed? [1]

5. Draw the frequency response of Low Pass Chebyshev filter. [1]

6. How is the order of filter determined? [1]

7. Write the advantage of higher order filter. [1]

8. Write the disadvantage of higher order filter. [1]

9. Write the transfer function of all poles filter. [1]

10. Determine the order N of Butterworth filter for which A_{max}=1dB,ω_s/ ω_p =1.5 and A_{min} =30dB.What is the minimum stop band attenuation realized?. If A_{min} = 30dBexactly,to what value can A_{max} be reduced? [3]

11. Write the application of tuned Amplifier. [1]

12. Find the frequency of selection of the tuned circuit having L=100mh and C=0,01 MFD.

[2]

13. Draw the frequency response of parallel tuned circuit if the output voltage is taken across L and C. [2]

14. Design a RC 2nd order HPF active filter having cutoff frequency 4 khz [3]

BITS ID. No.:-____________________ Student Name:-____________________

BITS, Pilani – Dubai

Dubai International Academic City, Dubai
I-semester, Academic Year:-2008-2009

Date : 17th September, 2008
Maximum Marks: 20

INSTR C313 MICROELECTRONIC CIRCUITS

Surprise Quiz No.1

Note:-Unless explicitly mentioned, each question carries 1 **mark for the most appropriate answer**.

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1. The term "Amplifier" is defined as: ____
____.
2. An amplifier response is characterized by the equation: $v_o(t) = Av_i(t)$ where $v_o(t)$ and $v_i(t)$ are the output and input signals respectively, and A is a constant representing the magnitude of amplification. If this relationship between $v_o(t)$ and $v_i(t)$ contains ____________________, then the waveform of $v_o(t)$ will be no longer be identical to that of $v_i(t)$; and the amplifier is said to exhibit nonlinear distortion.
3. Voltage gain A_v in dB can be expressed as: ____________________.
4. Power gain A_p in dB can be expressed as: ____________________.
5. Amplifier efficiency, η is defined as: ____________________.
6. Assuming that an amplifier with its voltage gain as A_v uses two power supplies and its transfer characteristics exhibit the positive and negative saturation levels denoted by L_+ and L_-, in order to avoid signal distortion in the output waveform, the input signal swing must be kept with the linear range of operation, expressed by the following inequality:

____.

7. A General Purpose Amplifier's frequency response on the low frequency side can be modeled as a ______________________________ Single time constant circuit.
8. A General Purpose Amplifier's frequency response on the high frequency side can be modeled as a ______________________________ Single time constant circuit.
9. If a BJT is to work as an amplifier, indicate the biasing conditions to be established:
Emitter Base Junction : ____________; Collector Base Junction:____________.

(please turn over)

10. List the names of any two Biasing schemes for biasing BJT as an Amplifier

a. ______________________

b. ______________________

11. List any Five Significant Parameters of a General Purpose Amplifier [2.5 M]

a. ______________________

b. ______________________

c. ______________________

d. ______________________

e. ______________________

12. Indicate the following typical voltages in a BJT when it is appropriately biased: [1.5 M]

a. V_{BE}(cut-in) = ________

b. V_{CE} (cut-off) = ________

c. V_{CE}(saturation) = ________

13. Draw the low frequency model of a Current Amplifier with Source and Load connected to it appropriately(in the space provided below) [2.0 M]

14. On the basis of its loading effect what are the four classifications of an Amplifier [2.0 M]

a. ______________________

b. ______________________

c. ______________________

d. ______________________

15. Draw the Small Signal AC Equivalent Model of a BJT CE Amplifier [2.0 M]

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BITS ID. No.:-____________________ Student Name:-____________________

BITS, Pilani – Dubai

Dubai International Academic City, Dubai
I-semester, Academic Year:-2008-2009

Date : 27th November, 2008

Maximum Marks:____

INSTR C313 MICROELECTRONIC CIRCUITS

Surprise Quiz No.3

Note:-Unless explicitly mentioned, each question carries **2 marks** **for the most appropriate answer.**

- - -

1. A two stage amplifier is required to have an upper cut off frequency of 2 MHz and a lower cutoff frequency of 30 Hz. The upper and lower cutoff frequencies of the individual, but identical, stages are [ ]
   A. 4 MHz, 60 Hz
   B. 3 MHz, 20 Hz
   C. 3 MHz, 60 Hz
   D. 4 MHz, 20 Hz
2. Most of the linear ICs are based on the two transistor differential amplifier because of its [ ]
   A. Input voltage dependent linear transfer characteristic
   B. High voltage gain
   C. High input resistance
   D. High CMRR .
3. Class AB operation is often used in power (large signal) amplifiers in order to [ ]
   A. Get maximum efficiency
   B. Remove even hormonics
   C. Overcome a cross-over distortion
   D. Reduce collector dissipation
4. In a CE amplifier, the un-bypassed emitter resistance provides [ ]
   A. Voltage shunt feedback
   B. Current Series feedback
   C. Negative-voltage feedback
   D. Positive-current feedback
5. Most of the linear ICs are based on the two transistor differential amplifier because of its [ ]
   A. Input voltage dependent linear transfer characteristic
   B. High voltage gain
   C. High input resistance
   D. High CMRR
6. A Class-A transformer coupled transistor power amplifier is required to deliver a power output of 10 watts. The maximum power rating of the transistor should be not less than [ ]
   A. 5 W
   B. 10 W
   C. 20 W
   D. 40 W

7. A differential amplifier is invariably employed as the input (very first) stage of all OPAMPs. This is done basically to provide the OPAMPs with a very high [ ]
   A. CMRR
   B. Bandwidth
   C. Slew Rate
   D. Open Loop Gain
8. A multistage amplifier has a low-pass response with three real poles at $s=-\omega_1$, $-\omega_2$, and $s=-\omega_3$. The approximate overall bandwidth B of the amplifier is given by [ ]
   A. $B = \omega_1+\omega_2+\omega_3$.
   B. $1/B = (1/\omega_1)+(1/\omega_2)+(1/\omega_3)$.
   C. $B = (\omega_1.\omega_2.\omega_3)^{1/3}$
   D. B = Square root of $(\omega_1^2+\omega_2^2+\omega_3^2)$
9. An amplifier has an open loop gain of 100, an input resistance of 1 KΩ, and an output resistance of 100Ω. A feedback network with a feedback factor of 0.99 is connected in a voltage series feedback mode. The new input and output resistances are __________ and ____________ respectively.
10. Amplifier efficiency, η is defined as: ______________________________.

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BITS ID. No.:-____________________ Student Name:-____________________

BITS, Pilani – Dubai

Dubai International Academic City, Dubai

I-semester, Academic Year:-2008-2009

Date: 18th December, 2008

Max. Marks : 45
Time : 20 mts

INSTR C313 / EEE C424 MICROELECTRONIC CIRCUITS

Surprise Quiz No.5

Note:-Unless explicitly mentioned, each question carries **1mark** **for the most appropriate answer**.

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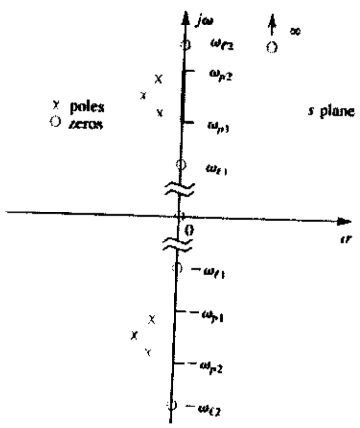
1) List the four different types of Filters that perform frequency selection function: [4 M]
   a) ____________________
   b) ____________________
   c) ____________________
   d) ____________________

2) List the four parameters using which the transmission of a low-pass filter is specified: [4 M]
   a) ____________________
   b) ____________________
   c) ____________________
   d) ____________________

3) The process of obtaining filter transfer function that meets given specifications is known as:
   ____________________. [1 M]

4) Identify the order and type of filter from the pole zero plot given below:
   Order is :__________; Type of the Filter is:____________________ [2 M]



5) The magnitude function for an Nth-order Butterworth filter with a passband edge ω_p, is given by:

$|T(jw)| =$

in which the parameter ε is given by : ______________________ [2 M]

6) The expression for A_{max}, the maximum variation in passband transmission of a Butterworth low-pass filter is given by :

$A_{max} =$ ______________________ [1 M]

7) Make a statement that describes the property, as a consequence of which the Butterworth response is termed as Maximally flat response.

____ [1 M]

8) The magnitude function for an Nth-order Chebyshev filter with a passband edge ω_p, is given by:

$|T(jw)| =$ for $\omega<\omega_p$ [1 M]

$|T(jw)| =$ for $\omega<\omega_p$ [1 M]

in which the parameter ε is given by : ______________________ [1 M]

9) The expression for A_{max}, the maximum variation in passband transmission of a Butterworth low-pass filter is given by :

$A_{max} =$ ______________________ [1 M]

10) Indicate the four steps using which the transfer function of a Chebyshev lowpass filter can be obtained from the transmission specifications of a lowpass filter. [4 M]

a) ____

b) ____

c) ____

d) ____

11) Indicate in the space provided below the plot of s-plane singularities of a typical 2-pole Notch filter with: center frequency ω_o; and pole quality factor, Q; and a high frequency gain of a_2. [2 M]

12) Frequency response of a tuned amplifier is characterized by the following three parameters: [3 M]

a) ______________________________

b) ______________________________

c) ______________________________

13) The skirt selectivity of a tuned amplifier is defined as ______________________________

______________________________. [1 M]

14) Draw a circuit diagram, in the space provided below, that depicts the basic principle of tuned amplifiers using MOSFET as the active device: [2 M]

15) Transformers are employed in Tuned amplifiers mainly because of the following practice problem:

______________________________ and the main function of the transformer, thus employed is to have ______________________________. [2 M]

16) Draw the frequency response of (i) a typical synchronously tuned and (ii) a stagger tuned amplifier depicting both individual and overall responses of employed multiple stages, if any. [2 M]

17) An inductance of 36 μH is resonated with a a 1000-pF capacitor in a tuned amplifier. If the inductor is tapped at one-third of its turns and a 1kΩ resistor is connected across the one-third part, find f_o and Q of this resonator connected to the tuned amplifier. [2 M]

18) A transistor used as a power amplifier supplied 0.85 W to a 4 KΩ load. The zero-signal dc collector current is 31 mA, and the dc collector current with signal is 34 mA. Determine the percent second-harmonic distortion. [2 M]

19) A single transistor is operating as an ideal class B amplifier with 1-KΩ load. A dc meter in the collector circuit reads 10 mA. How much signal power is delivered to the load? [3 M]

20) The effect of the capacitance from collector to base (C_μ) can be taken into account during analysis and / or design of double tuned BJT amplifier by using its ______________________ and there ______________________ methods that exist to minimize its effect. [2 M]

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BITS-Pilani Dubai,
Dubai International Academic City, Dubai
III Year, I Semester, Academic Year 2008-09

Evaluation Component : **Comprehensive Examination (Closed Book)**

EEE C424 / INSTR C313 MICROELECTRONIC CIRCUITS

Date : 4th Jan. 2009
Duration: 3 hours

Max. Marks: 100
Weightage: 40%

Note:- 1. ANSWER ALL QUESTIONS
2. Make assumptions, if any, but explicitly indicate the assumptions made

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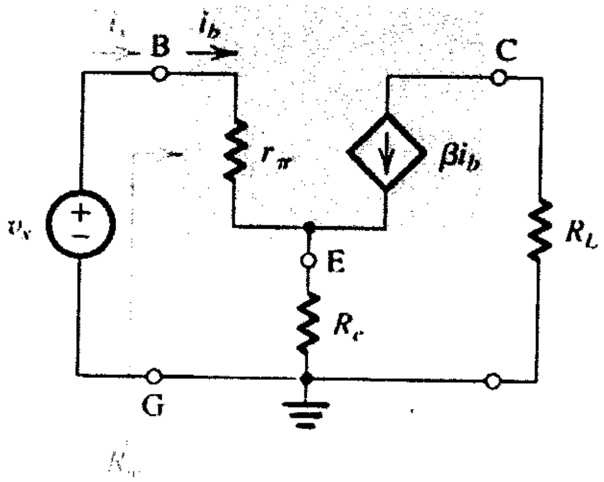
1) Define and write briefly (using a couple of sentences) on the following terms with reference to Amplifiers: [1x10=10 M]
   a) Transfer Characteristics
   b) Maximum Signal Handling Capacity
   c) Voltage Gain in dB
   d) Frequency Response
   e) Amplifier's Stability
   f) 'A Circuit' of a Feedback Amplifier
   g) Common Mode Gain, A_c of a Differential Amplifier
   h) Common Mode Rejection Ratio (CMRR) of Differential Amplifiers
   i) Efficiency of a Power Amplifier
   j) Skirt Selectivity of a Tuned Amplifiers

2)
   a) List the FIVE important steps in the systematic process of analyzing BJT transistor amplifier circuits employing small signal BJT circuit models [5 M]
   b) Draw the h-parameter model of a BJT in CE Configuration with voltage source and load resistance connected to BJT. Define all the model parameters and derive expressions this amplifier's mid-band voltage gain. [1+4+2=7.0 M]
   c) Determine the input impedance, R_{in}, of the circuit shown below: [3 M]

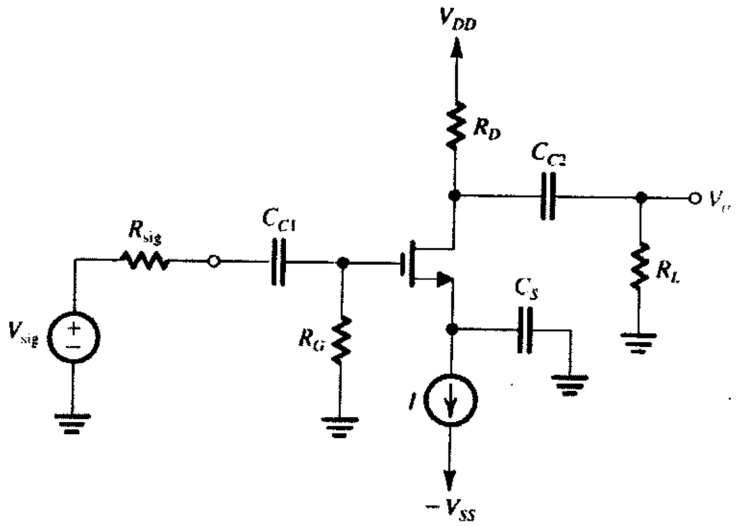


(Please Turn Over to Page 2)

3)

a) Draw the MOSFET high frequency model indicating all its components using standard notation and derive an expression for the figure of merit (f_T) of MOSFET's high frequency operation from fundamentals. [2+3=5.0 M]

b) Consider a CS amplifier, shown below, which is fed with a signal source having an internal resistance R_{sig}=100 KΩ. The amplifier has R_G=4.7 MΩ; R_D=R_L= 15KΩ; g_m = 1mA/V; r_o=150KΩ, C_{gs}=1pF and C_{gd}=0.4pF.



Find:

i. the mid band gain [2 M]
ii. upper 3-dB frequency f_H [3 M]
iii. both (i) and (ii) above if R_{sig} is reduced to 10 KΩ [2+3=5 M]

4)

a) A series-series feedback amplifier employs a basic amplifier with input and output resistances each of 1kΩ and gain A=2000 V/V. The feedback factor β=0.1 V/V. Find

i) the gain, A_f; [1 M]

ii) the input resistance, R_{if}; and [2 M]

iii) the output resistance, R_{of} [2 M]

b) A feedback amplifier is to be designed using a feedback loop connected around a two stage amplifier. The first stage is direct coupled small signal amplifier with a high upper 3-dB frequency. The second stage is a power output sage with a mid band gain of 10V/V with upper and lower 3-dB frequencies of 8 kHz and 80 Hz respectively. The feedback amplifier should have a mid band gain of 100 V/V and upper 3-dB frequency of 40kHz.

i) What is the required gain of the small-signal amplifier? [2 M]

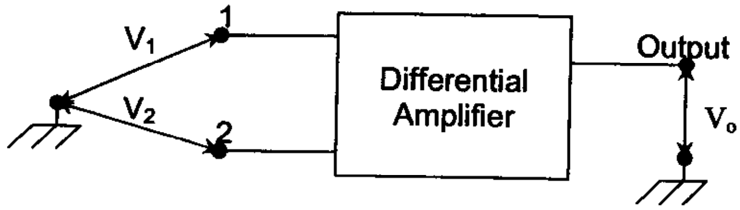
ii) What value of β should be used? [1 M]

iii) What does the lower 3-dB frequency of the overall amplifier will become? [2 M]

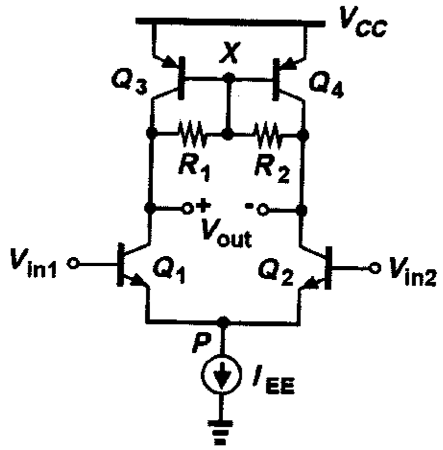
(Please Turn Over to Page 3)

5)

a) Obtain an expression for the output voltage of the following differential amplifier in terms of CMRR (ρ), Common-mode voltage (V_c) and the Differential voltage (V_d) [5 M]



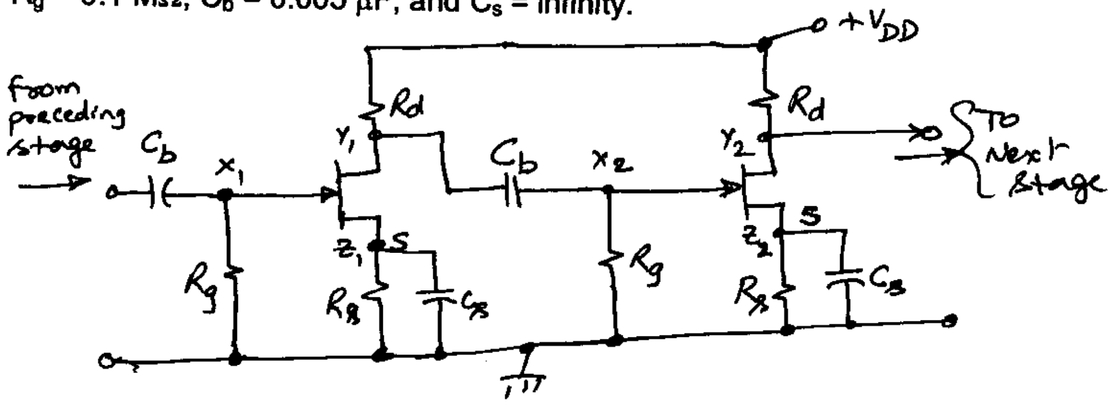
b) Consider the circuit shown below, for which the Early Voltage (V_A) for each of the Transistors is given as: V_{ANPN} = 5 V and $V_{A,PNP}$ = 4 V.



i) Explain under what conditions of this circuit, the differential amplifier depicted above "rejects" a common-mode input voltage [1 M]

ii) If $R_1 = R_2 = 5\ k\Omega$, what value of I_{EE} is required to achieve a differential voltage gain of 50? [2 M]

6) A Three stage RC Coupled amplifier, as in the circuit diagram shown below, uses field-effect transistors with the following parameters g_m = 2.6 mA/V, r_d = 7.7 KΩ, R_d = 10 KΩ, R_g = 0.1 MΩ, C_b = 0.005 μF, and C_s = infinity.



a) Evaluate overall mid band voltage gain in decibels [3 M]

b) f_L of each individual stage and [3 M]

c) the overall lower 3dB frequency [4 M]

7) A three pole feedback amplifier has a dc gain without feedback of -10^4. All three open-loop poles are at f=2 MHz.
   a) What is the maximum value of β for which the amplifier is stable? [2 M]
   b) Assume that one of the poles is shifted to f_1=100 kHz. Using the value of β found in part (a), what is the gain margin of the modified circuit? [2 M]

8) Draw the Circuit of a Class B push-pull output stage and prove, from fundamentals that, it offers a theoretical maximum conversion efficiency of 78.5%. What is crossover distortion in Class B operation and indicate its source. [1+3+0.5+0.5 =5 M]

9) Draw a neat sketch to depict the specification of the transmission characteristics of a Butterworth low pass active filter both in terms of magnitude response and pole zero plot and list the four important parameters that aptly specify its magnitude response. Also enumerate the steps in designing the same meeting these specifications.[1+1+2+4=8 M]

10)Write Short Notes on any THREE of the following topics: [3x 5 M=15 M]
   a) Compare and contrast significant features of a BJT with those of an FET, in its use as an amplifying device
   b) Circuit diagram and features of Transistor pairs: Cascode, Darlington and Totempole
   c) Stagger Tuned Amplifiers
   d) Stability analysis of Feedback Amplifiers
   e) Current Mirrors and their applications
   f) Typical features of the input, output and intermediate stages of a multistage amplifier
   g) PSPICE as an Electronic Design Automation (EDA) tool

* * * WISH YOU ALL THE BEST * * *