Code: 20A04302T **R20**

B.Tech II Year I Semester (R20) Supplementary Examinations April/May 2024

ANALOG CIRCUITS

(Electronics & Communication Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

(a) How does the input impedance increase due to Darlington connection? 2M

(b) Draw MOSFET cascode current source circuit. 2M

(c) Define Gain bandwidth product. 2M

(d) Why does R-C coupling gives constant gain over mid frequency range? 2M

(e) How frequency stability can be improved in oscillators? 2M

(f) Mention the features and advantages of the crystal oscillator. 2M

(g) State what happens to the voltage gain of an amplifier if the bypass capacitor is open circuited. 2M

(h) What is meant by cross over distortion. How it is eliminated? 2M

(i) What are the requirements of a tuned amplifier? 2M

(j) Compare stagger tuning and synchronous tuning. 2M

PART – B

(Answer all the questions: 05 X 10 = 50 Marks)

2 (a) Explain with a neat circuit diagram of Darlington connection and derive the expression for A_i, A_v, R_i & R_o. 5M

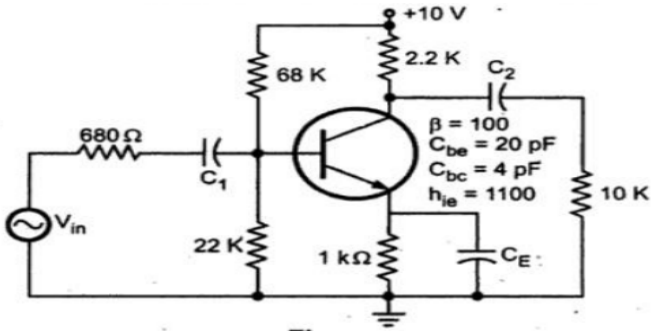
(b) Design a CMOS differential amplifier with an output gain stage to meet a set of specifications. The magnitude of voltage gain of each stage is to be at least 600. Bias currents are to be $I_Q=I_{REF}$=100 μA, and biasing of the circuit is to be V_+ = 2.5 V and V_- = 2.5 V. 5M

OR

3 (a) What is a cascode amplifier? Draw the circuit diagram and derive an expression for mid band voltage gain of cascode amplifier. 5M

(b) Draw the circuit of a two-stage RC coupled amplifier. Derive expressions for its effective lower cut-off frequency and effective upper cut-off frequency. If the individual stages are having f_L = 20 Hz and f_H = 200 kHz, calculate the respective values for the cascaded two-stage. 5M

4 (a) Determine the high frequency response of the amplifier circuit shown in the figure below. 5M



(b) Find the mid band gain A_M and the upper 3-dB frequency f_H of a CS amplifier 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 = 15 KΩ, g_m = 1 mA/V, r_o = 150 KΩ, C_{gs} = 1 pF, and C_{gd} = 0.4 pF. 5M

OR

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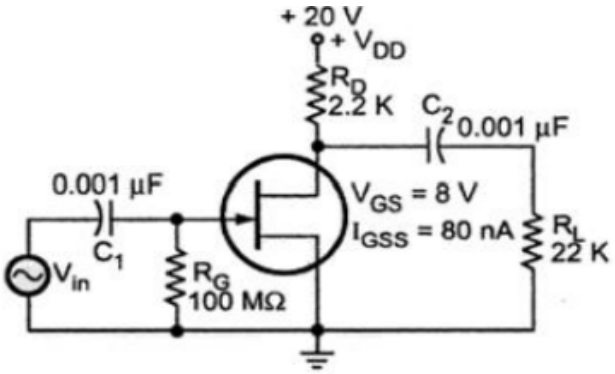
5 (a) Determine the low frequency response of the amplifier circuit shown in the figure below. 5M



(b) Discuss about internal capacitive effects and the high-frequency model of the BJT 5M

6 (a) An amplifier without feedback has a voltage gain of 50, input impedance of 1 kΩ and output impedance of 2.5 KΩ. Obtain the input and output impedances of current-shunt negative feedback amplifier using the above amplifier with a feedback factor of 0.2. 5M

(b) Describe Hartley oscillator with neat diagram and outline its working principle. 5M

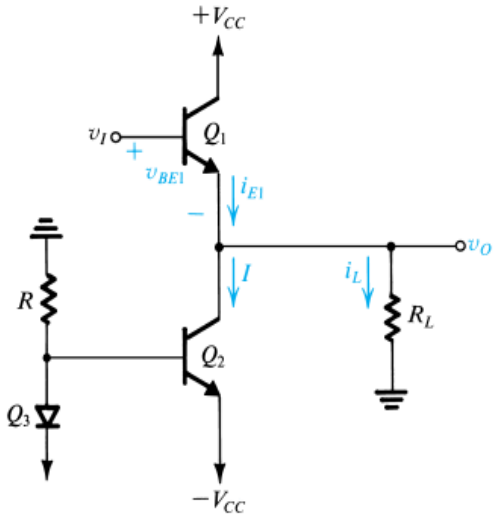
OR

7 (a) An amplifier circuit has a gain of 60 dB and output impedance Zo = 10 KΩ. It is required to modify its output impedance to 500 Ω by applying negative feedback. Calculate the value of the feedback factor. Also find the percentage change in overall gain, for 10% change in the gain of the internal amplifiers. 5M

(b) Explain how Wien bridge oscillator satisfies Barkhausen criterion for oscillation and derive an expression for the frequency of oscillation. 5M

8 (a) Discuss about Class B Output Stage operation along with transfer characteristics and power-conversion efficiency. 5M

(b) 5M



Consider the emitter follower in figure shown above with Vcc =10V, I = 100 mA, and R_L= 100Ω.
(i) Find the power dissipated in Q_1 and Q_2 under quiescent conditions (V_0 = 0 V),
(ii) For a sinusoidal output voltage of maximum possible amplitude (neglecting V_{CESat}), find the average power dissipation in Q_1 and Q_2. Also find the load power.

OR

Contd. in Page 3

9	(a)	List different biasing techniques for the class AB output stage circuit. Explain any one method in detail.	5M
	(b)	Write a brief note on MOS power transistors.	5M
10	(a)	Explain the principle of stagger tuning technique of transformer – coupled amplifier that is used to obtain band pass filter characteristic with pass band of 10 KHZ with all necessary diagrams for illustration.	5M
	(b)	Illustrate the working of monos table multivibrator along with output waveforms. Derive the expression for period of the mono stable multivibrator.	5M
		OR	
11	(a)	Draw the circuit of double-tuned transformer-coupled amplifier. Discuss the nature of responses of the amplifier for different values of KQ = 1; KQ >1 and KQ < 1.	5M
	(b)	Explain the working of an astable multivibrator with necessary base and collector waveforms.	5M

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Code: 20A04302T

R20

B.Tech II Year I Semester (R20) Supplementary Examinations August/September 2023

ANALOG CIRCUITS

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Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

	(a)	What are the applications of a differential amplifier?	2M
	(b)	Define Common mode rejection ratio of a differential amplifier.	2M
	(c)	Sketch the schematic diagram of MOSFET.	2M
	(d)	Define 3-db bandwidth of an amplifier.	2M
	(e)	Explain Barkhausen criterion in oscillator.	2M
	(f)	Write the principle of oscillator?	2M
	(g)	Give any two applications of Power transistors.	2M
	(h)	What is cross over distortion?	2M
	(i)	What are the applications of astable multi vibrator?	2M
	(j)	What are the drawbacks are of stagger tuned amplifiers?	2M

PART – B

(Answer all the questions: 05 X 10 = 50 Marks)

2	(a)	Derive the Input and output impedance of Darlington pair circuit.	5M
	(b)	Describe the Non ideal characteristics of Differential Amplifier.	5M
		OR	
3	(a)	Perform the small signal analysis of BJT differential pair.	5M
	(b)	Draw the Circuit diagram of Cascode amplifier and explain its working	5M
4		Discuss the High – Frequency response of the source and emitter flowers.	10M
		OR	
5	(a)	A MOSFET has a drain-circuit resistance Rd of 100 K and operates at 20 KHz. Calculate the voltage gain of this device as a single stage. The MOSFET parameters are g_m = 1.6 mA/V, r_d = 44KΩ, C_{g3} = 3.0, C_{ds} = 1.0, C_{gd} = 2.8 PF.	5M
	(b)	Derive the voltage gain, input admittance and input miller capacitance of the CE amplifier using its high frequency equivalent circuit.	5M
6	(a)	Draw & explain the operation of RC phase shift oscillator.	5M
	(b)	What is feedback? Compare the four types of feedback topologies with respect to basic amplifier, R_{if} and R_{of}.	5M
		OR	
7	(a)	Briefly explain about the four basic feedback topologies.	5M
	(b)	With a neat sketch explain the operation of crystal oscillator.	5M
8	(a)	Explain the operation of the Class B push-pull amplifier and derive the expression for maximum overall efficiency. What is the major drawback of Class B operation?	5M
	(b)	Explain the CMOS Class AB output stages.	5M
		OR	

Contd. In page 2

9	(a)	Sketch the circuit of a transformer coupled class A amplifier and explain its operation.	5M
	(b)	Explain the working of the Class AB amplifier with the help of a neat diagram.	5M
10	(a)	With a neat circuit diagram and waveforms, explain the working of a Monostable multivibrator.	5M
	(b)	Draw the circuit diagram of the single-tuned amplifier and derive the expression for voltage gain.	5M

OR

11	(a)	Derive the expression for the 3dB bandwidth of the double-tuned amplifier. And also write the disadvantages.	5M
	(b)	With a neat circuit diagram and waveforms, explain the working of a Bistable multivibrator.	5M

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