Printed Page:- 04 Subject Code:- BEC0302

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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: III - THEORY EXAMINATION (2024 - 2025)

Subject: Analog Circuits

Time: 3 Hours Max. Marks: 100

General Instructions:

IMP: *Verify that you have received the question paper with the correct course, code, branch etc.*

1. This Question paper comprises of three Sections -A, B, & C. It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.

2. Maximum marks for each question are indicated on right -hand side of each question.

3. Illustrate your answers with neat sketches wherever necessary.

4. Assume suitable data if necessary.

5. Preferably, write the answers in sequential order.

6. No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.

SECTION-A 20

1. Attempt all parts:-

1-a. The upper cutoff frequency of multistage amplifier is .....than the upper cutoff frequency of single stage amplifier. (CO1,K1) 1

(a) equal or more

(b) more

(c) less

(d) None of the above

1-b. The use of amplifier in a circuit is to _____ for input signal. (CO1,K1) 1

(a) Provide a phase shift

(b) Provide strength

(c) Provide frequency enhancement

(d) Make circuit compatible

1-c. In the power amplifier the efficiency .....from class A to class C mode. (CO2,K1) 1

(a) increases

(b) drecreases

(c) constant

(d) None of these

1-d. THD is a measure of _____. (CO2, K1) 1

(a) Amount of harmonic content present in a signal

(b) Amount of output power
(c) Total amount of distortion
(d) Total amount of amplitude distortion

1-e. An noninverting amplifier has voltage gain of 10. Find the output voltage for Vin = 5V. (CO3,K2) 1

(a) 50V
(b) -50V
(c) +Vsat
(d) -Vsat

1-f. The output of a particular OP-amp increases 6 V in 12 μs. The slew rate is …. (CO3,K2) 1

(a) 90 V/μs
(b) 0.67 V/μs
(c) 0.5 V/μs
(d) None of the mentioned

1-g. In ideal Differential Amplifier, if same signal is given to both inputs, then output will be. (CO4, K2) 1

(a) Same as input
(b) Double the input
(c) Not equal to zero
(d) Zero

1-h. The compliance voltage is related to.....(CO4, K2) 1

(a) oscillators
(b) current mirrors
(c) amplifiers
(d) Power amplifiers

1-i. Clap oscillator is the improved version of..... (CO5, K1) 1

(a) Phase shift oscillator
(b) Colpitts Oscillator
(c) Wein bridge Oscillator
(d) Crystal Oscillator

1-j. _____is the RC Oscillator. (CO5, K1) 1

(a) Phase – shift oscillator
(b) Hartley-Oscillator
(c) Colpitt's Oscillator
(d) Crystal Oscillator

2. Attempt all parts:-

2.a. explain the change in gain and bandwidth in case of multistage amplifier. 2

(CO1,K1,K2)

2.b.	What are the effects of negative feedback on stability and bandwidth of an amplifier? (CO2, K1,K2)	2
2.c.	Draw and explain unity gain amplifier. (CO3, K2)	2
2.d.	What are the characteristics of current mirror? (CO4, K1)	2
2.e.	Write the Barkhausen Criterion for sustained oscillations. (CO5, K1)	2

SECTION-B 30

3. Answer any five of the following:-

3-a.	Draw and explain the Frequency response of single and multistage amplifiers. (CO1, K1, K2)	6
3-b.	Draw the small signal model for CE amplifier and calculate its different parameters. (CO1, K1, K2)	6
3-c.	Compare the different feedback topologies with respect to input and output resistances. (CO2, K1)	6
3-d.	Explain the operation of class A Power amplifier with necessary waveforms. (CO2, K1)	6
3.e.	Explain the operation of Schmitt trigger with applications. (CO3, K1, K2)	6
3.f.	What is a current mirror? For modified current mirror, show that I_out=I_ref/[1+2/β(1+β)]. (CO4, K1, K2)	6
3.g.	Explain the Operation of RC phase shift Oscillator with neat diagram and give the condition for sustained oscillation. (CO5, K1, K2)	6

SECTION-C 50

4. Answer any one of the following:-

4-a.	Draw the high and low frequency transistor model of CE amplifier and derive the expression for cutoff frequencies with its frequency response. (CO1, K1, K2)	10
4-b.	Explain small signal equivalent model for CE amplifier. Calculate Input Resistance Ri, Output Resistance Ro, and Voltage gain Av. (CO1, K1, K2)	10

5. Answer any one of the following:-

5-a.	Draw the circuit of class B amplifier. Explain the crossover distortion in class B amplifier and explain how it can be reduced? (CO2, K1, K2)	10
5-b.	Explain the Voltage series feedback amplifier and also calculate amplifier gain, input impedance, and output impedance. (CO2, K1, K2)	10

6. Answer any one of the following:-

6-a.	Design a second order band pass Butterworth filter with lower and higher cutoff frequency of 500Hz & 1500Hz respectively. Draw the designed circuit and frequency response for the pass band gain of 4. (CO3, K1, K2)	10
6-b.	Explain integrator and differentiator circuits with input and output waveforms. (CO3, K1, K2)	10

7. Answer any one of the following:-

7-a.	Design a Widlar current source to give I_{out} = 6 μA and I_{ref} =1.2 mA, Given that V_{BE2} = 0.7 V and V_T = 26 mV, V_{CC} = 20 V and $\beta = 120$. (CO4, K1, K2)	10
7-b.	Draw and derive the expression of current transfer ratio of improved Wilson current mirror. (CO4,K1,K2)	10

8. Answer any <u>one</u> of the following:-

8-a.	Explain the working of Wein Bridge Oscillator with the help of circuit diagram. Write the expression for frequency of oscillation. A wein bridge oscillator has a frequency of 500 kHz, if the value of C is 1000pF, determine the value of R. (CO5, K1, K2)	10
8-b.	Explain the working of Astable multivibrator using IC555 with its circuit diagram and waveform. (CO5, K1, K2)	10