Printed Page:- 05 **Subject Code**:- **AEC0402**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: IV - THEORY EXAMINATION (2022-2023 **)**

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. Which of the following amplifier is designed to operate in digital pulses? (CO1) 1

(a) Class D

(b) Class C

(c) Class AB

(d) Class B

1-b. Which of the following FETs has the lowest input impedance? (CO1) 1

(a) JFET

(b) MOSFET depletion-type

(c) MOSFET enhancement-type

(d) None of the above

1-c. A certain noninverting amplifier has R1 of 1 kΩ and Rf of 100 kΩ. The closed-loop voltage gain is …. (CO2) 1

(a) 100000

(b) 1000

(c) 101

(d) 100

1-d. The two modes of operation of op-amp are _____. (CO2) 1

(a) Differential and Common Mode

(b) Differential and Inverting Mode

(c) Non-inverting and Inverting Mode

(d) None of these

1-e. The output of a Schmitt trigger is a (CO3) 1

(a) pulse waveform.

(b) sawtooth waveform.

(c) sinusoidal waveform.

(d) triangle waveform

1-f. Voltage drop across Superdiode is ____. (CO3) 1

(a) 0.6 V

(b) 0.7 V

(c) 0V

(d) infinite

1-g. If Barkhausen criterion is not satisfied by an oscillator circuit, it will (CO4) 1

(a) Using only a series tuned circuit as a load on the amplifier

(b) Providing adequate positive feedback

(c) Phase shifting the output by 1800 and feeding this output to the input

(d) None of the above

1-h. Quartz crystal is most commonly used in crystal oscillators because ..... (CO4) 1

(a) It has superior electrical properties

(b) It is easily available

(c) It is quite inexpensive

(d) None of the above

1-i. The current source which has a very high output resistance? (CO5) 1

(a) Simple current mirror

(b) Wilson current mirror

(c) Widlar current mirror

(d) All of the mentioned

1-j. When the two input terminals of a differential amplifier are grounded (CO5) 1

(a) the base currents are equal.

(b) the collector currents are equal.

(c) an output error voltage usually exists.

(d) the ac output voltage is zero.

2. Attempt all parts:-

2.a. Why gain of amplifier is reduced at lower and higher frequencies? (CO1) 2

2.b. Draw and explain close loop inverting Op-Amp amplifier. (CO2) 2

2.c. Draw the block diagram of IC 555 Timer. (CO3) 2

2.d. Give the comparison between RC and LC oscillators. (CO4) 2

2.e. What are the possible sources of error in the current mirrors? (CO5) 2

SECTION B **30**

3. Answer any <u>five</u> of the following:-

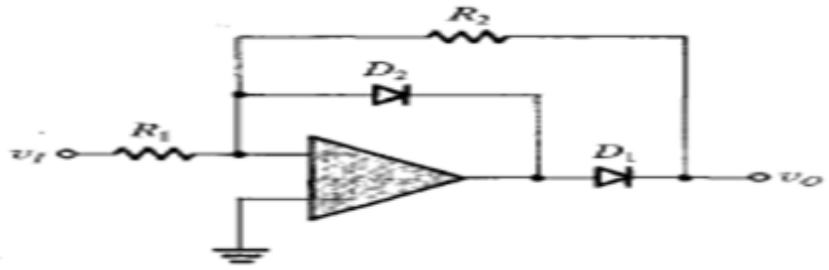
3-a. Prove that the closed-loop gain is reduced in the current series feedback amplifier. (CO1) 6

3-b. Draw and explain the frequency response of CS/CE amplifier. (CO1) 6

3-c. Explain why proper interpretation of op-amp data sheets is important. (CO2) 6

3-d. What information is contained in the typical op-amp data sheet? (CO2) 6

3.e. Consider the circuit in Fig. with Rx = 1 kQ and R2 = 10 kQ. Find v0 and the voltage at the amplifier output for v, = +1 V, -1 0 mV, and - 1 V. Assume the op amp to be ideal with saturation voltages of ±12 V. The diodes have 0.7V voltage drops al 1 mA, and the voltage drop changes by 0.1 V per decade of current change. (CO3) 6



3.f. Explain the principle of operation of clapp oscillator. (CO4) 6

3.g. For an Op-Amp having a slew rate of SR = 2 V/s, what is the maximum closed-loop voltage gain that can be used when the input signal varies by 0.5 V in 10 s? (CO5) 6

SECTION C **50**

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

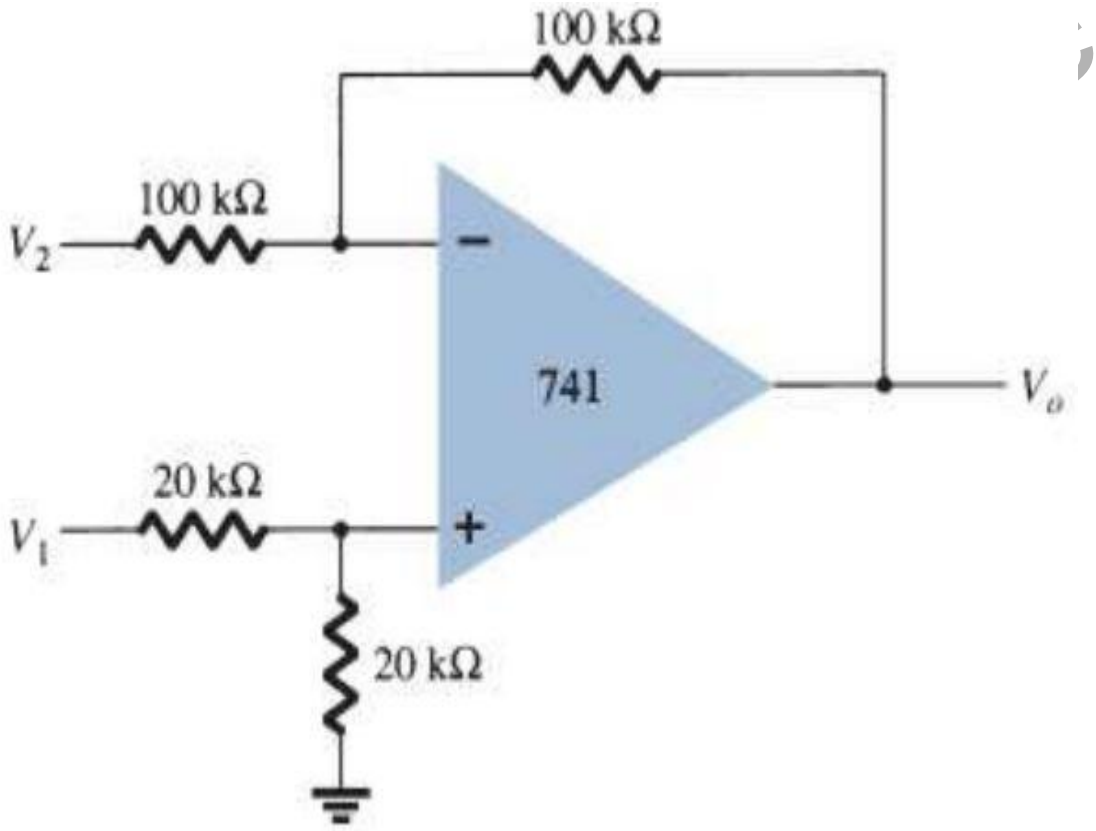
4-a. Determine the voltage gain, input and output impedance with feedback for voltage series feedback having A= -100, Ri = 10kohm, Ro = 20kohm for feedback of (a) β= -0.1 (b) β= 0.5. (CO1) 10

4-b. Explain and derive the effective bandwidth of an n-stage Cascaded amplifier? (CO1) 10

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

5-a. Determine the gain and bandwidth of a CE Amplifier from its frequency response curve. (CO2) 10

5-b. Determine the output voltage for the circuit of fig. V 1 = 5Volt and V $_2$ = 10 Volt. (CO2) 10



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

6-a. A Schmitt trigger with the upper threshold level VUT=0V and hysteresis width is 0.2V convert 1KH sine wave of 4Vpp into a square wave. Calculate the time duration of the negative and positive portion of the output waveform. (CO3) 10

6-b. Design a first-order bandpass filter for the following specification; Cut off frequency, f_L = 100Hz, f_H= 500Hz, and A=5. Also, draw Gain Vs Frequency response curve. (CO3) 10

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

7-a. Sketch the circuit of a phase shift oscillator and explain its design approach. What are the factors which affect the frequency stability of an oscillator? (CO4) 10

7-b. Explain the drawback of Colpitt oscillator and how it is overcome in Clapp oscillator. (CO4) 10

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

8-a. Explain in detail how we can improve the performance of current mirror circuits of various types. (CO5) 10

8-b. Describe what happens to each of the output voltages (Vout1 and Vout2) as the input voltage (Vin) decreases: (CO5) 10