**Printed Page:-04** **Subject Code:- AEC0402**

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**NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA**

**(An Autonomous Institute Affiliated to AKTU, Lucknow)**

**B. Tech**

**SEM: IV - THEORY EXAMINATION (2024 - 2025)**

**Subject: Analog Circuit**

**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. During high frequency applications of a B.J.T, which parasitic capacitors arise between the collector and the base?(CO1,K1) 1

(a) Cje and Cb

(b) Ccs

(c) Cπ

(d) Cμ

1-b. Current series feed back amplifier is also called as ..... (CO1,K1) 1

(a) VCVS

(b) VCCS

(c) CCCS

(d) CSVS

1-c. The common-mode gain is …. (CO2,K1) 1

(a) very high

(b) very low

(c) always unity

(d) unpredictable

1-d. The input offset current equals the …. (CO2,K1) 1

(a) difference between two base currents

(b) average of two base currents

.

(c) collector current divided by current gain

(d) none of these

1-e. In op-amp differentiator circuit the capacitor is---(CO3,K1) 1

(a) Feedback element

(b) Input element

(c) Both of these

(d) None of these

1-f. A third order filter will have a roll off rate of---(CO3,K1) 1

(a) -20dB/decade

(b) -30 dB /decade

(c) -60 dB /decade

(d) -40 dB/decade

1-g. Which among the following does not belong to the category of LC oscillators? (CO4,K1) 1

(a) Hartley oscillator

(b) Colpitts oscillator

(c) Clapp oscillator

(d) Wein bridge oscillator

1-h. Clapp oscillator is an improved version of_____ (CO4,K1) 1

(a) LC oscillator

(b) RC oscillator

(c) RL oscillator

(d) Relaxation oscillator

1-i. The current source which has a very high output resistance? (CO5,K1) 1

(a) Simple current mirror

(b) Wilson current mirror

(c) Widlar current mirror

(d) All of the mentioned

1-j. How to improve CMRR value? (CO5,K1) 1

(a) Increase common mode gain

(b) Decrease common mode gain

(c) Decrease Differential mode gain

(d) None of the above

2. Attempt all parts:-

2.a. What do you understand of frequency response of an amplifier? (CO1,K2) 2

2.b. Draw the transfer characteristic and equivalent circuit of an Op-Amp. (CO2,K2) 2

2.c. What are the advantages of active filters over Passive filters? (CO3,K2) 2

2.d. Discuss the Barkhausen criterion for sustained oscillations. (CO4,K2) 2

| | | |
|---|---|---|
| 2.e. | What do you understand by compliance voltage in case of current mirror? (CO5,K2) | 2 |

**SECTION-B** 30

3. Answer any five of the following:-

| | | |
|---|---|---|
| 3-a. | Explain the operation of class B Power amplifier with necessary waveforms. (CO1,K2) | 6 |
| 3-b. | Show that the lower cutoff frequency of multistage amplifier is higher than the lower cutoff frequency of single stage amplifier. (CO1,K2) | 6 |
| 3-c. | Define the AC and DC parameters of Op-amp. (CO2,K2) | 6 |
| 3-d. | Compare ideal and practical parameters of Op-amp. (CO2,K2) | 6 |
| 3.e. | Derive the expression for output voltage of an integrator circuit and also write its applications. (CO3,K3) | 6 |
| 3.f. | Explain the Operation of Wien Bridge Oscillator with neat diagram and give the condition for sustained oscillation. (CO4,K3) | 6 |
| 3.g. | An op-amp with a differential gain of $A_d$ = 4000 is supplied with input voltages of $Vi_1$=150 µV and $Vi_2$=140 µV. Determine the output voltage if the value of CMRR is 1000. (CO5,K2) | 6 |

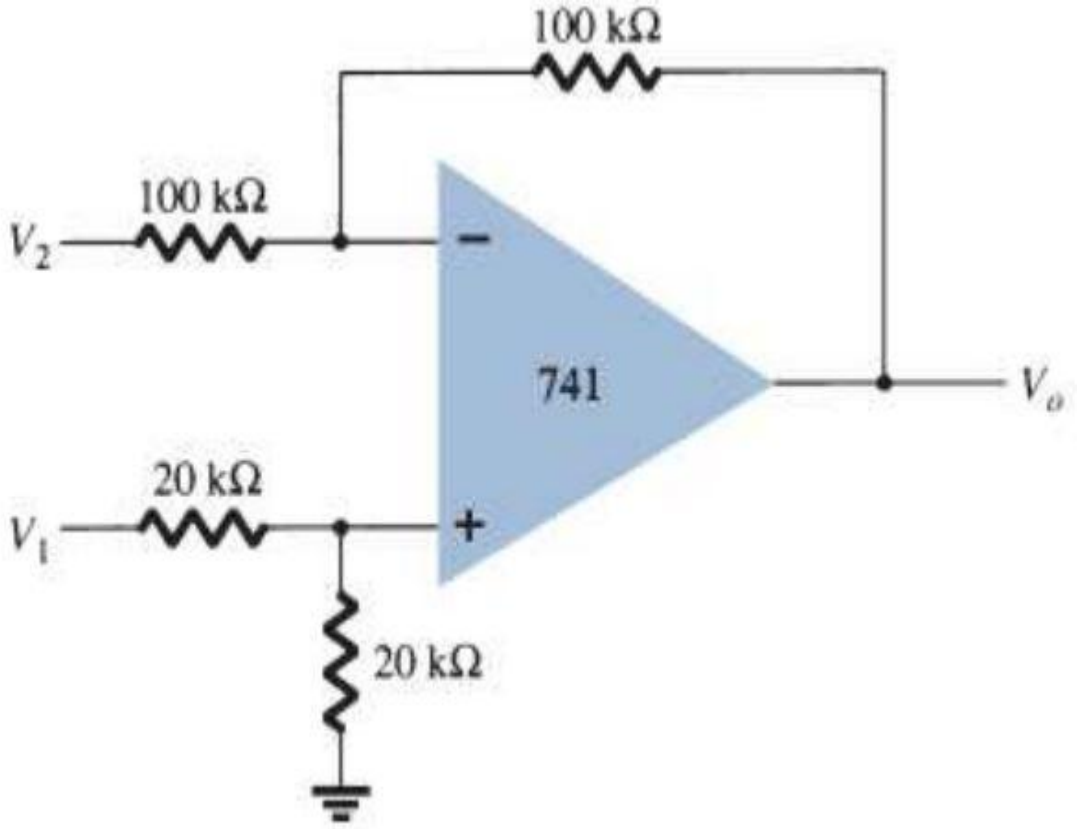
**SECTION-C** 50

4. Answer any one of the following:-

| | | |
|---|---|---|
| 4-a. | Explain the voltage series feedback amplifier and also calculate amplifier gain, input impedance, and output impedance. (CO1,K3) | 10 |
| 4-b. | Derive the expression for higher cutoff frequency of single stage CS/CE amplifier. (CO1,K3) | 10 |

5. Answer any one of the following:-

| | | |
|---|---|---|
| 5-a. | Discuss an Op-Amp based voltage follower circuit with advantages. (CO2,K3) | 10 |
| 5-b. | What is an Op-amp? Determine the output voltage for the circuit of fig. V1 = 5 Volt and $V_2$ = 10 Volt. (CO2,K3) | 10 |




6. Answer any one of the following:-

| | | |
|---|---|---|
| 6-a. | Discuss with neat diagram the Schmitt trigger ith waveform and write its applications. (CO3,K3) | 10 |
| 6-b. | Draw and explain the block diagram of IC 555 Timer. Also, write the expression of output frequency for astable multivibrator. (CO3,K3) | 10 |

7. Answer any one of the following:-

| | | |
|---|---|---|
| 7-a. | Draw the circuit diagram of RC phase shift Oscillator and Explain its working. (CO4,K3) | 10 |
| 7-b. | Draw Hartley Oscillator Circuit. In a Hartley oscillator, the value of the capacitor in the tuned circuit is 500 p F and the two sections of coil have inductances 38 μH and 12 μH. Find the frequency of oscillations and the feedback factor β. (CO4,K3) | 10 |

8. Answer any one of the following:-

| | | |
|---|---|---|
| 8-a. | Draw and explain the Wilson BJT current mirror. Also discuss in detail how it can be improved. (CO5,K3) | 10 |
| 8-b. | Draw and derive the expression of current transfer ratio of modified current mirror. (CO5,K3) | 10 |