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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA
(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: II - THEORY EXAMINATION (2025- 2026)

Subject: Analog Circuits

Time: 2 Hours

Max. Marks: 50

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

15

1. Attempt all parts:-

- (1.1) The input capacitor in an amplifier is called: (CO1, K1) 1
- (a) Coupling
 - (b) Bypass
 - (c) Leakage
 - (d) None
- (1.2) Which amplifier is most suitable for RF applications?(CO2,K1) 1
- (a) Class A
 - (b) Class B
 - (c) Class C
 - (d) Class AB
- (1.3) What is gain of ideal op-amp?(CO3,K1) 1
- (a) 0
 - (b) 100
 - (c) infinite
 - (d) 10
- (1.4) What does a comparator circuit do? (CO4,K1) 1
- (a) Adds two signals
 - (b) Compares two voltages and outputs a digital signal
 - (c) Integrates the input signal
 - (d) Filters out high frequencies
- (1.5) Barkhausen criterion requires loop gain to be(CO5,K1) 1

- (a) Less than 1
- (b) Equal to 1
- (c) Greater than 1
- (d) Zero

2. Attempt all parts:-

- (2.1) Define bandwidth of an amplifier. (CO1, K1) 2
- (2.2) Define Class A amplifier and its efficiency(CO2,K1) 2
- (2.3) Define CMRR, find CMRR if $A_d=100$, $A_c =20$ (CO3,K1) 2
- (2.4) Draw the circuit diagram of Differentiator using op-amp. (CO4,K1) 2
- (2.5) Why positive feedback is required in oscillators?(CO5,K1) 2

SECTION-B

15

Answer any one of the following:-

- (3.1) Discuss the operation of NPN transistor with diagram. (CO1, K2) 3
- (3.2) Determine the overall gain of a two-stage RC-coupled amplifier. (CO1, K3) 3

Answer any one of the following:-

- (3.3) Compare Class A and Class B amplifiers(CO2,K3) 3
- (3.4) Write the advantages and disadvantages of negative feedback amplifiers.(CO2,K2) 3

Answer any one of the following:-

- (3.5) Draw Opamp block diagram and explain the function of each block.(CO3,K1) 3
- (3.6) Calculate the output voltage of an op-amp adder if two equal input voltages of 3 V are applied. Given $R_1=4\text{ k}\Omega$, $R_2=5\text{ k}\Omega$, and $R_f=10\text{ k}\Omega$. (CO3,K3) 3

Answer any one of the following:-

- (3.7) Draw and Explain the Schmitt Trigger Circuit with Output waveform.(CO4,K3) 3
- (3.8) Explain the working of an op-amp integrator circuit with waveform and derive the output Expression(CO4,K3) 3

Answer any one of the following:-

- (3.9) Differentiate between Hartley and Colpitts oscillators.(CO5,K2) 3
- (3.10) An RC phase shift oscillator uses $R = 10\text{ k}\Omega$ and $C = 0.02\text{ }\mu\text{F}$. Find its frequency.(CO5,K2) 3

SECTION-C

20

4. Answer any one of the following:-

- (4.1) With neat diagram, explain the low-frequency small-signal model of a CE amplifier. (CO1, K4) 4
- (4.2) Analyze the frequency response of a single-stage CE amplifier. (CO1, K3) 4

5. Answer any one of the following:-

- (5.1) Draw the topologies of all four types of negative feedback amplifiers.(CO2,K3) 4
- (5.2) Show that the BW with negative feedback is $1+\beta A$ times the BW without feedback of an amplifier.(CO2,K3) 4

6. Answer any one of the following:-

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|---|---|---|
| (6.1) | Explain the working of an inverting amplifier using op-amp. Derive the gain equation.(CO3,K3) | 4 |
| (6.2) | Drive an expression for Gain of Non Inverting amplifier using Opamp (CO3,K2) | 4 |
| 7. Answer any <u>one</u> of the following:- | | |
| (7.1) | Explain the architecture and working of a Successive Approximation ADC with timing diagram.(CO4,K4) | 4 |
| (7.2) | A first-order active low-pass filter uses a resistor $R = 10\text{ K}\Omega$ and $C = 0.01\text{ }\mu\text{F}$. Calculate the cut-off frequency. Find the gain at low frequency if the op-amp is configured for a gain of 5.(CO4,K4) | 4 |
| 8. Answer any <u>one</u> of the following:- | | |
| (8.1) | Explain the working of RC phase shift oscillator with neat diagram.(CO5,K2) | 4 |
| (8.2) | Explain the working of IC 555 as an astable multivibrator.(CO5,K2) | 4 |

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