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Subject Code: BEC402

Roll No:

BTECH

(SEM. IV) THEORY EXAMINATION 2025-26

ANALOG CIRCUITS

TIME: 3 HRS

M.MARKS: 70

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief.

2x7 = 14

QNo.	Question	CO	Level
(a)	Define the terms voltage amplifier, current amplifier.	1	K2
(b)	How does feedback affect the gain of an amplifier?	2	K3
(c)	Explain the concept of gain margin and phase margin in amplifier stability.	2	K2
(d)	Explain Barkhausen criterion for oscillation.	3	K1
(e)	If differential mode gain of a differential amplifier is 1000 and common mode gain is 10, calculate the CMRR in decibel for it.	4	K2
(f)	Define minimum sustainable voltage and maximum usable load of a Current mirror Circuits.	4	K1
(g)	In a non-inverting Op-Amp given that input voltage is 0.5 V, $R_f=100\text{ k}\Omega$ and $R_{in}=10\text{ k}\Omega$, then what is the output voltage?	5	K3

SECTION B

2. Attempt any *three* of the following:

7 x 3 = 21

(a)	Describe emitter follower. Derive expression for gain, input & output resistance.	1	K3
(b)	Design a series-series feedback amplifier and calculate expressions for A_{β} , R_{of} and R_{if} .	2	K2
(c)	Derive the expression of frequency of oscillation for RC phase shift oscillator. Explain its silent features.	3	K2
(d)	Explain current steering and properties of a current mirror. Also derive the relation between output current and reference current in Wilson current mirror.	4	K2
(e)	What is Super Diode? Describe the working of half wave precision rectifier giving its transfer characteristic.	5	K2

SECTION C

3. Attempt any *one* part of the following:

7 x 1 = 7

(a)	Derive the expression of voltage gain, input resistance and output resistance of common source amplifier with source resistance.	1	K3
(b)	Derive the expressions for input impedance, output impedance, open circuit voltage gain, overall voltage gain and short circuit current gain after completing the AC analysis of common emitter amplifier with emitter resistance.	1	K3

4. Attempt any *one* part of the following:

7 x 1 = 7

(a)	Describe the current Shunt feedback topology. Calculate the voltage gain, input and output resistance of voltage series feedback amplifier having $A_v = 300$, $R_i = 1.5\text{ k}\Omega$, $R_o = 50\text{ k}\Omega$ and $\beta = 1/15$.	2	K3
(b)	Why is the Miller effect significant in high-frequency amplifiers? What is the effect of low and high frequency applications on amplification gain?	2	K2

5. Attempt any *one* part of the following:**7 x 1 = 7**

(a)	Explain the operation of a Wien bridge oscillator. calculate the frequency of oscillation for given values of R_1 and $R_2 = 100\text{ k}\Omega$, C_1 and $C_2 = 50\text{ pF}$	3	K3
(b)	Explain the working of a tank circuit. Also derive the frequency of oscillation and condition of gain to get sustained oscillations for Colpitts oscillator.	3	K2

6. Attempt any *one* part of the following:**7 x 1 = 7**

(a)	Explain the differential mode operation of differential amplifier. Also derive the mathematical expressions for differential mode gain.	4	K3
(b)	Explain the term Input Common Mode Range (ICMR) and its significance in differential amplifier design.	4	K1

7. Attempt any *one* part of the following:**7 x 1 = 7**

(a)	Draw Op-Amp based Schmitt Trigger Circuit and explain its operation, hysteresis loop and applications.	5	K2
(b)	Explain Class B operation in amplifiers and discuss its drawback. How it can be overcome.	5	K2

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