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Electronics and Communication Engineering Department End-Semester Examination (May 2023)

Branch: ECE

Subject: Linear Integrated Circuits Time: 3 Hours Note: 1. Attempt all questions Semester: 4<sup>th</sup> Subject Code: EC-221 Maximum Marks: 50

**Q.1** Calculate the single-ended output voltage  $V_0$  for the amplifier circuit shown below:

 $V_{ij} = 2 \text{ mV}$  +9 V  $47 \text{ k}\Omega = R_C$   $V_o$   $Q_1$   $Q_2$   $Q_1$   $Q_2$   $Q_2$   $Q_3$   $Q_4$   $Q_2$   $Q_4$   $Q_2$   $Q_4$   $Q_2$   $Q_4$   $Q_2$   $Q_4$   $Q_5$   $Q_4$   $Q_5$   $Q_4$   $Q_5$   $Q_4$   $Q_5$   $Q_5$ 

- Q. 2 An operational amplifier with a slew rate SR = 0.5 V/μs is used as an inverting amplifier to obtain a gain A<sub>V</sub> of 100. The voltage gain versus frequency response is flat up to 10 kHz. Determine the following:
  (i) The maximum peak input signal that can be applied without any distortion to the output.
  (ii) The maximum frequency of the input signal to obtain a sine wave output of peak voltage of 2 V.
- Q. 3 (i) How will you compute the Bandwidth of an Op-Amp based AC amplifier. (8)
  (ii) Draw and explain the operation of an AC noninverting amplifier with single supply voltage. Further, draw its input and output waveforms.
- **Q. 4(a)** If  $V_1(t) = 10 \cos(2t) mV$  and  $V_2(t) = 0.5t mV$  below, find  $V_0(t)$  for t > 0. Assume that the (5) voltage across the capacitor is zero at t = 0.



(8)

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(b) Describe pole-zero and dominant pole compensation in negative feedback amplifiers in detail.

OR

How will you compensate the effect of input offset voltage using offset voltage compensating network for following three configurations:

(i) Inverting amplifier with feedback

(ii) Noninverting amplifier with feedback

(iii) Differential amplifier with feedback

- Q. 5(a) Discuss the principle of an oscillator. Draw an op-amp based circuit for generating a triangular wave (4) and write the expression of the frequency of oscillation.
  - (b) Design a low-pass active filter at a cutoff frequency of 1 kHz with a passband gain of 2 and draw its (4) frequency response.
- Q. 6(a) With mathematical expressions, discuss the generation of square waveform using Schmitt Trigger (4) circuit.
  - (b) Discuss the following circuit operations:

(i) Op-Amp based voltage-limiting circuits.

(ii) Op-Amp based negative clipper circuit.

(4)