KUMARAGURU
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B.E/B.TECH DEGREE EXAMINATIONS: NOV / DEC 2024
(Regulation 2018)

Fourth Semester

ELECTRONICS AND COMMUNICATION ENGINEERING

U18ECI4202: Analog Electronics and Integrated Circuits

COURSE OUTCOMES

CO1: Design and verify feedback amplifiers, LC and RC oscillators.

CO2: Describe the characteristics of operational amplifiers.

CO3: Develop and analyze operational amplifier application circuits.

CO4: Build data converters for the given specifications.

CO5: Operate 555 timer circuit and generate waveforms.

Time: Three Hours   **Maximum Marks: 100**

Answer all the Questions:-
PART A (10 x 2 = 20 Marks)
### (Answer not more than 40 words)

1. For the amplifier shown in the figure below identify the type of feedback topology.   CO1   [K2]
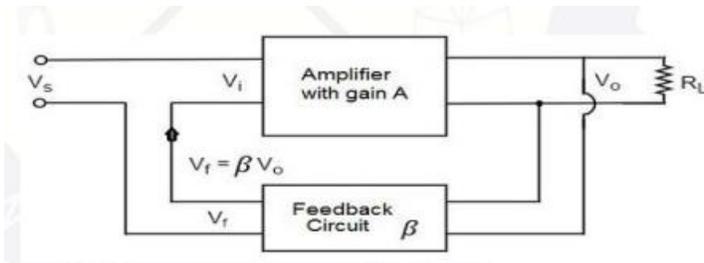
2. A voltage series feedback amplifier has a voltage gain with feedback as 83.33 and feedback   CO1   [K3]
   ratio as 0.01. Find the voltage gain of the amplifier without feedback.

3. The CMRR of an Op amp is 100 dB. Input common mode voltage is 12 V. Differential   CO2   [K3]
   voltage gain is 4000. Calculate the output common mode voltage. Justify your answer with
   respect to input common mode voltage.

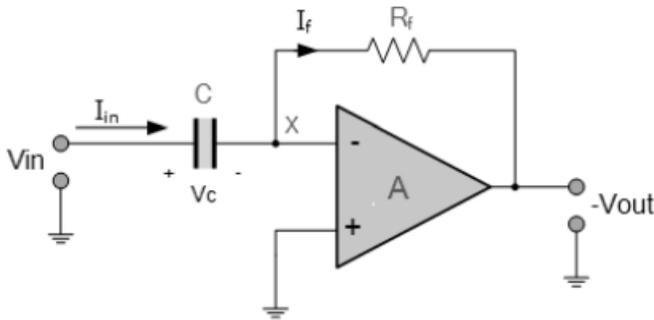4. List the characteristics of an ideal op-amp.   CO2   [K1]

5. The LED in the circuit will be ON if Vi= _____   CO3   [K_3]
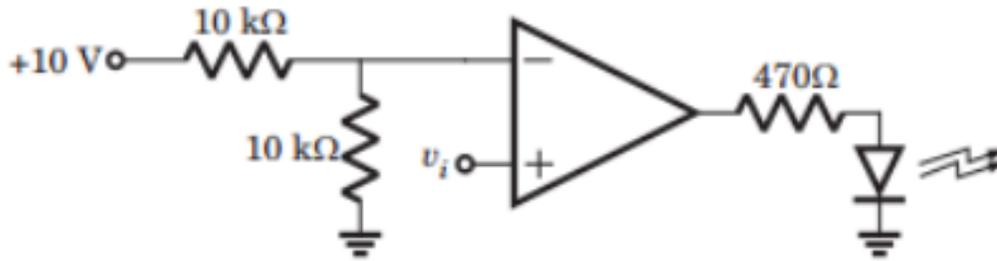
6. Write the mathematical function of the circuit given below: CO3   [K_2]

7. Design a Sineware generator for $f_0 = 500$ Hz (Assume c=0.1µF) and draw the circuit diagram   CO5   [K_4]

    for the same.

8. Calculate the frequency of oscillation of VCO for $R_T = 1$ KΩ, $C_T = 0.1$ µF   CO5   [K_3]

9. Obtain resolution for a 12-bit ADC with voltage range 0-5 V.   CO4   [K_3]

10. Mention the fastest ADC technique and explain why is it fastest.   CO4   [K_2]

Answer any FIVE Questions:-
PART B (5 x 16 = 80 Marks)
(Answer not more than 400 words)

11. a) With neat circuit diagram, explain in detail about Hartley oscillator and derive 8   CO1   [K_2]
        the expression for frequency of oscillations.

    b) Sketch the current series feedback amplifier using BJT and derive the 8   CO1   [K_2]
        expressions for gain without and with feedback, feedback factor, input and output
        impedance of the circuit.

12. a) Draw the block schematic of various stages in an op-amp and describe the 8   CO2   [K_2]
        operation of a Differential amplifier with BJT. Obtain its transfer characteristics.

    b) List the DC Characteristics of an op-amp. Illustrate how to nullify the effects of 8 CO2   [K_2]
        the DC Characteristics, so that the op-amp functions closure to the ideal one.

13. a) Consider a lossy integrator, the component values Ri = 10 kΩ, RF = 100 kΩ, CF = 10 nF. Determine the lower frequency limit of integration and analyze the output response for the input given: A) Step input (Vi=2V for 0≤ t ≤ 0.3mS B) Square wave(2V peak and 5KHz) — 8 — CO3 [K4]

b) Design a second order Butterworth low pass filter having cut-off frequency of 1 kHz and draw its frequency response characteristics. — 8 — CO3 [K3]

14. a) With the neat circuit diagram, explain the operation of Instrumentation Amplifier and describe an application where it suits exactly. — 8 — CO3 [K3]

b) Design a Schmitt trigger circuit with V_{UT} = +3 V and V_{LT} =-3 V, ±Vsat = ± 14 V. Choose R_2 as 3 kΩ. Explain the output of designed circuit with 20 V(p-p) signal. Analyze the same circuit by changing the threshold voltages to ± 5 V. — 8 — CO3 [K4]

15. a) Draw the functional block diagram of 555 Timer and explain its monostable mode of operation with necessary sketches and timing diagrams. — 8 — CO5 [K3]

b) A PLL IC 565 connected for FM detection has R_1=12.4 kΩ, C_1=0.006 µF and C=0.04 µF. The supply voltage is 12 V. Determine the Free-running frequency, Capture range and Lock-range. — 8 — CO5 [K3]

16. a) For a 4 bit R-2R ladder type D/A converter, assume the full scale voltage as 12 V. Calculate the step change in output voltage when an input is varying from 1000 to 1111. — 8 — CO4 [K3]

b) Elaborate the operation of binary weighted resistor network with op-amp for digital to analog conversion. — 8 — CO4 [K2]

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