

Enrollment No: \_\_\_\_\_

Exam Seat No: \_\_\_\_\_

# C.U.SHAH UNIVERSITY

## Summer Examination-2018

**Subject Name: Integrated Circuits & Applications**

**Subject Code: 4TE04ICA1**

**Branch: B.Tech (Electrical)**

**Semester: 4**

**Date: 26/04/2018**

**Time: 10:30 To 01:30**

**Marks: 70**

Instructions:

- (1) Use of Programmable calculator & any other electronic instrument is prohibited.
  - (2) Instructions written on main answer book are strictly to be obeyed.
  - (3) Draw neat diagrams and figures (if necessary) at right places.
  - (4) Assume suitable data if needed.
- 

**Q-1**

**Attempt the following questions:**

**(14)**

- 1) Draw the pin diagram of 741 IC.
- 2) Draw the ideal transfer curve of an operational amplifier.
- 3) The gain of a non-inverting amplifier is always less than 1. Determine whether the given statement is true or false.
- 4) Give any four non-linear applications of operational amplifier.
- 5) Which type of feedback is applied in order to operate op-amp as an oscillator?
- 6) The input impedance of a voltage follower circuit is very \_\_\_\_\_(High/Low).
- 7) Give any four characteristics of an ideal-opamp.
- 8) Draw the ideal gain vs frequency response of band pass filter.
- 9) A certain inverting amplifier has  $R_i$  of 1 k $\Omega$  and  $R_f$  of 100 k $\Omega$ . find the closed-loop voltage gain ?
- 10) What is the effect of negative feedback on the bandwidth of an amplifier?
- 11) Which amplifier can be used to calibrate the physical input quantity to electrical output quantity?
- 12) The gain of voltage follower circuit is\_\_\_\_\_
- 13) Give any two applications of voltage to current converter.
- 14) Give any two applications of instrumentation amplifier.



**Attempt any four questions from Q-2 to Q-8**

**Q-2**

**Attempt all questions**

**(14)**

a) Derive the equation of gain  $A = 1 + \frac{R_F}{R_1}$  for a non-inverting amplifier where  $R_F$  is the feedback resistance and  $R_1$  is the input resistance of an amplifier.

**07**

b) The 741 IC op-amp having the following parameter is connected as a non-inverting amplifier with  $R_1 = 470\Omega$  and  $R_F = 4.7K\Omega$ :

**07**

Open Loop Gain  $A = 400,000$

Input Impedance =  $33M\Omega$

Output Impedance  $R_o = 60\Omega$

Unity Gain Bandwidth  $f_o = 0.6MHz$

Compute: i) Gain with Feedback  $A_F$

ii) Input Impedance with Feedback  $R_{iF}$

iii) Output Impedance with Feedback  $R_{oF}$

iv) Bandwidth with Feedback  $f_F$

**Q-3**

**Attempt all questions**

**(14)**

a) Draw the circuit diagram of voltage follower circuit (unity gain amplifier) and Derive the following equation for voltage follower circuit.

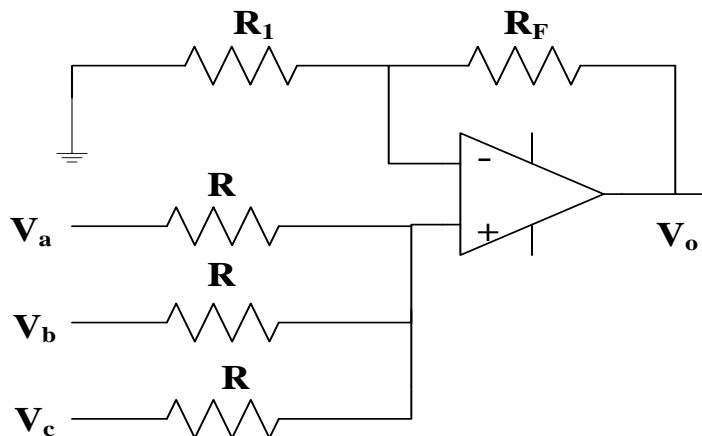
**07**

a) Input Resistance with Feedback      b) Output Resistance with Feedback

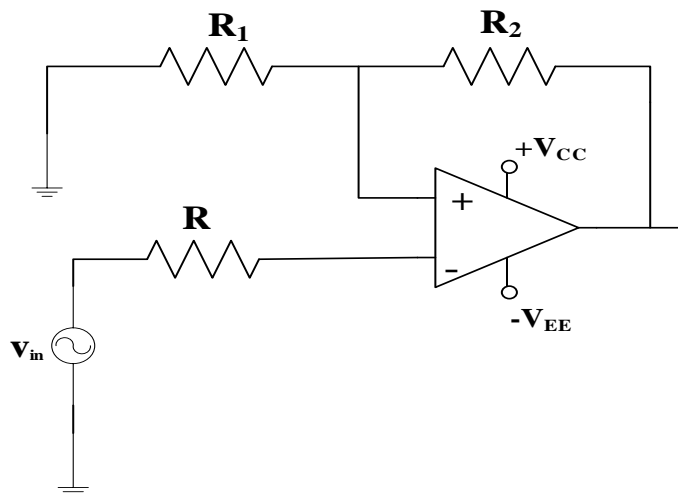
b) The circuit shown in below figure is to be used as an averaging amplifier with the following specification:  $V_a = V_b = 1.5V$ ,  $V_c = 3V$ ,  $R_1 = R = 1.5k\Omega$  and

**07**

$V_o = 5.2V$ . Determine the required value of  $R_F$ .



- Q-4**      **Attempt all questions**      **(14)**
- a) Draw the circuit diagram of instrumentation amplifier using transducer bridge and explain how it can be used to measure the physical quantity.      **07**
- b) Draw the circuit diagram of differential amplifier with one op-amp and derive the following equations.      **07**
- a) Closed Loop Voltage Gain      b) Input Resistance with Feedback
- Q-5**      **Attempt all questions**      **(14)**
- a) Draw the circuit diagram of op-amp phase shift oscillator and explain its operation with necessary conditions for oscillations.      **07**
- b) Draw the circuit diagram of voltage to current converter with floating load and explain its operation.      **07**
- Q-6**      **Attempt all questions**      **(14)**
- a) Draw the circuit diagram and waveforms of op-amp based positive clipper circuit and explain its operation.      **07**
- b) Draw the circuit diagram of first order low pass filter and explain its operation.      **07**
- Q-7**      **Attempt all questions**      **(14)**
- a) Draw the circuit diagram of first order high pass filter and explain its operation.      **07**
- b) In the circuit shown in below figure  $R_1 = 150\Omega$ ,  $R_2 = 68k\Omega$ ,  $v_{in} = 500mV_{(p-p)}$  sine wave, and saturation voltges =  $\pm 14V$       **07**



- i) Determine the threshold voltages  $V_{ut}$  and  $V_{lt}$
- ii) What is the value of hysteresis voltage  $V_{hy}$  ?



**Q-8**

**Attempt all questions**

**(14)**

- a) Draw the circuit diagram and waveforms of *Astable multivibrator* using 555 Timer IC and explain its operation. **07**
- b) Draw the high frequency equivalent circuit of an op-amp and explain that open loop voltage gain of an op-amp is a function of frequency. **07**

