

# CBCS SCHEME

USN

--	--	--	--	--	--	--	--	--	--

17EC45

## Fourth Semester B.E. Degree Examination, Dec.2019/Jan.2020 Linear Integrated Circuits

Time: 3 hrs.

Max. Marks: 100

*Note: Answer any FIVE full questions, choosing ONE full question from each module.*

### Module-1

- 1 a. Define the following parameter of Op-Amp and also mention its typical values of 741:  
i) CMRR ii) Slew rate iii) Power supply voltage rejection. (06 Marks)  
b. Design an inverting amplifier using a 741 Op-Amp. The voltage gain is to be 50 and output voltage amplitude is to be 2.5V. (07 Marks)  
c. Derive the expression for output voltage of a difference amplifier and also explain the common mode nulling. (07 Marks)

**OR**

- 2 a. Discuss the methods of offset nulling in Op-Amp circuit. (06 Marks)  
b. Design a Non-inverting amplifier using 741-Op-Amp, is to amplify the input voltage of 100mV to a level of 3V output. (07 Marks)  
c. Explain the various methods of Biasing Op-Amp. (07 Marks)

### Module-2

- 3 a. Sketch and explain high  $Z_{in}$  capacitor coupled voltage follower with necessary design steps and also show that the input impedance is very high as compared to direct coupled voltage follower. (08 Marks)  
b. Design inverting amplifier circuit is to be capacitor coupled and to have a signal frequency range of 10Hz to 1kHz. If load resistance is  $250\Omega$  with  $A_v = 50$  and  $V_o = 3V$ . Use 741 Op-Amp. (08 Marks)  
c. What is Precision Rectifiers? Mention the advantages of it. (04 Marks)

**OR**

- 4 a. Sketch precision full wave rectifier using HWR and summing circuit and explain it. (08 Marks)  
b. What is instrumentation amplifier? Compare differential input/output amplifier and a difference amplifier. (06 Marks)  
c. Design a basic current amplifier circuit has an input current of 1mA and a  $100\Omega$  load resistor. The current gain is 5. (06 Marks)

### Module-3

- 5 a. Prove that  $V_{0(\text{comp})} = \left(1 + \frac{R_2}{R_{TC}}\right) \frac{KT}{q} \ln\left(\frac{V_{in}}{V_{ref}}\right)$  of a log amplifier. (08 Marks)  
b. Sketch and explain the working of phase shift oscillator using Op-Amp and also write the design equations. (08 Marks)  
c. What are the applications of analog multipliers? (04 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

OR

- 6 a. Draw an Op-Amp sample and hold circuit. Sketch the input signal, control, output waveforms and explain the circuit operation. (08 Marks)
- b. Explain the operation of an inverting Schmitt trigger with two different levels of trigger points using diodes. (08 Marks)
- c. For the voltage detector shown in Fig.Q.6(c). Design a value of  $R_1$  and  $R_2$ . Assume  $V_{R_2} = 1.5V$ . (04 Marks)

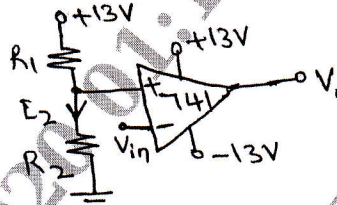


Fig.Q.6(c)

**Module-4**

- 7 a. Sketch the circuit and frequency response of a first order low pass filter and explain its operation. (06 Marks)
- b. Design a second order high pass filter to have a cut off frequency of 12kHz. Use a 715 Op-Amp with  $I_{B(max)} = 1.5\mu A$ . (07 Marks)
- c. List and explain the characteristics of three terminal IC regulators. (07 Marks)

OR

- 8 a. Draw the functional block diagram of a 723 regulator and explain it. (06 Marks)
- b. Explain how a fixed regulator can be used as an adjustable regulator. Design a fixed voltage regulator using 7805 to get an output of 7.5V. Assume  $I_{R_1} = 25mA$  and  $I_Q = 4.2mA$ . (07 Marks)
- c. Discuss the differences between wide band and narrow band pass filter. Sketch typical frequency response for each. Write the equations relating  $Q$ ,  $B$ ,  $f_1$  and  $f_2$ . (07 Marks)

**Module-5**

- 9 a. Draw the block diagram of a PLL and explain the functions of each block. (06 Marks)
- b. A 555 Astable multivibrator has  $R_A = 2.2K\Omega$ ,  $R_B = 6.8K\Omega$  and  $C = 0.01\mu F$ . Calculate:  
 i)  $t_{high}$   
 ii)  $t_{low}$   
 iii) free running frequency  
 iv) Duty cycle  
 and also draw the connection diagram (07 Marks)
- c. Derive the expression of pulse width of a monostable multivibrator using 555 IC timer and also design a monostable multivibrator with pulse width of 0.25msec. Assume  $C = 0.1\mu F$ . (07 Marks)

OR

- 10 a. Derive the expression of output voltage of a R – 2R ladder type DAC. (08 Marks)
- b. Draw the block diagram of a successive approximation type ADC and explain it. (08 Marks)
- c. Mention the applications of monostable multivibrator using 555 timer. (04 Marks)

\*\*\*\*\*