

# CBCS SCHEM

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17EC45

## Fourth Semester B.E. Degree Examination, De--20.19/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  $Z_o$ , 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 1 kHz. If load resistance is 2500 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 100fF load resistor. The current gain is 5. (06 Marks)

#### Module-3

- 5 a. Prove that  $V_{o(wmpl)} = \frac{R_f}{R_T c} \cdot \frac{KT}{q} \cdot \ln \left( \frac{V_{in}}{V_{ref}} \right)$  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)

**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 triggering 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)

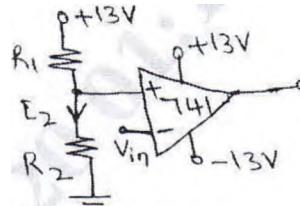


Fig.Q.6(c)

**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 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 fixed regulator can be used as adjustable regulator. Design fixed voltage regulator using 7805 to get an output of 7.5V. Assume  $I_R = 25mA$  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,  $\omega_i$  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  $R_A = 2.21M$ ,  $R_B = 6.81(0.0)$  and  $C = 0.010$ . 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)