

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 100f load resistor. The current gain is 5. (06 Marks)

Module-3

- 5 a. Prove that $V_{o(wmpl)} = \left(1 + \frac{R_f}{R_{Tc}} \right) \frac{KT}{q} \ln \left(\frac{V_{in}}{V_{ref}} \right)$ 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)

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)

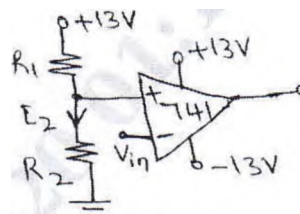


Fig.Q.6(c)

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 an 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 $I_R = 25mA$ 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 , t_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 $R_A = 2.21M$, $R_B = 6.81k$ 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 an $R - 2R$ 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)