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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 250Ω with Av = 50 and V_0 = 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 100Ω load resistor. The current gain is 5. **(06 Marks)**

Module-3

5 a. Prove that $V_{0(comp)} = \left(1+\frac{R_2}{R_{TC}}\right)\frac{KT}{q}\ell_n\left(\frac{V_{in}}{V_{ref}}\right)$ 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 a inverting Schmitt triggering with two different level 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)**

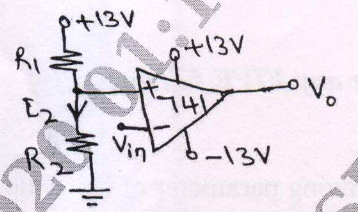

Fig.Q.6(c)

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 fixed regulator can be used as adjustable regulator. Design 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)**

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