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10EC46

**Fourth Semester B.E. Degree Examination, July/August 2021****Linear IC's and Applications**

Time: 3 hrs.

Max. Marks: 100

*Note: Answer any FIVE full questions.*

- 1 a. Write an ideal characteristics of an op-amp. (04 Marks)  
b. Define the following op-amp parameters:  
(i) CMRR  
(ii) PSRR  
(iii) Slew rate  
(iv)  $V_o$  (offset) (04 Marks)  
c. Explain how the op-amp can be used as a direct coupled:  
(i) Inverting  
(ii) Non-inverting  
(iii) Summing  
(iv) Difference amplifier (12 Marks)
- 2 a. Draw the circuit diagram and derive the design equations of a capacitor-coupled voltage follower. (10 Marks)  
b. Design the basic capacitor-coupled inverting amplifier with  $A_v = 50$ ,  $V_o = 2.5$ ,  $R_L = 250 \Omega$  and signal frequency ( $f_s$ ) = 10 Hz to 1 kHz. (10 Marks)
- 3 a. With suitable circuit and graph, how phase-lead and phase-lag compensation is used to stabilize op-amp circuit. (10 Marks)  
b. With a neat circuit diagram, explain  $Z_{in}$  mod technique for frequency compensation of op-amp circuit. (10 Marks)
- 4 a. Explain the operation of an instrumentation amplifier using three op-amps. (10 Marks)  
b. Draw and design a precision full-wave rectifier to produce 2V peak output from a sine wave input with a peak value of 0.5 V and frequency of 1 MHz, with supply voltage of  $\pm 15V$ . Select  $I_1 = 500 \mu A$ . (10 Marks)
- 5 a. Show how the current-to-voltage converter is realized using op-amp. (04 Marks)  
b. Realize logarithmic amplifier using op-amp and transistor. Derive the expression for output voltage. (08 Marks)  
c. Draw and design a phase-shift oscillator using op-amp to generate a sine wave of 100 Hz. Select  $C = 0.1 \mu F$ . (08 Marks)
- 6 a. Explain how the op-amp can be used as a zero-crossing detector. (04 Marks)  
b. Explain the working of an inverting Schmitt trigger. Draw input, output waveforms and transfer curve. (08 Marks)  
c. Using 741 op-amp, design and draw second order LPF with  $f_c = 5$  kHz. (08 Marks)
- 7 a. Give the classification of voltage regulators. Explain current fold back and current boosting techniques in voltage regulators. (08 Marks)  
b. Explain using op-amp, operation of switching voltage regulator. (06 Marks)

- c. Calculate the output voltage of the adjustable regulator shown in Fig.Q7(c), if  $R_2$  is varied from  $1\text{ K}\Omega$  to  $10\text{ K}\Omega$ , find the range of output voltage.

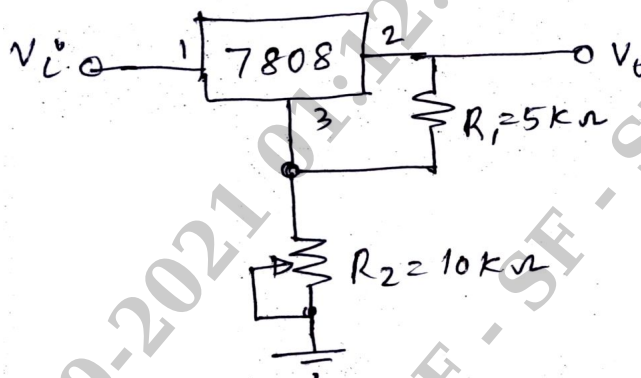


Fig.Q7(c)

(06 Marks)

- 8 a. With a neat block schematic, explain the operation of each component in PLL. (08 Marks)  
 b. Draw the circuit diagram of Astable multivibrator using 555 Timer and derive the expression for output signal frequency. (06 Marks)  
 c. Draw the circuit diagram and explain the operation of 3-bit R-2R D/A converter using op-amp. (06 Marks)

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