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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.***

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.

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 ±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 KΩ to 10 KΩ, find the range of output voltage.

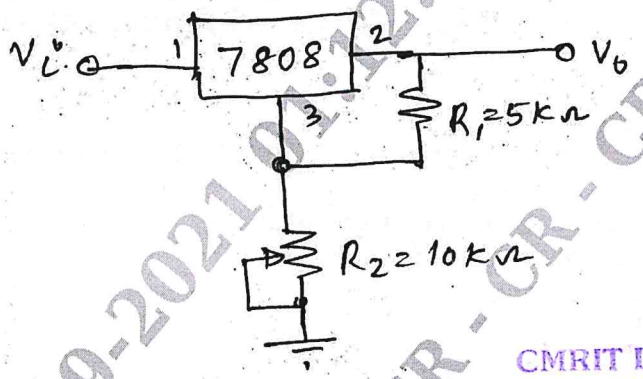


Fig.Q7(c) **(06 Marks)**

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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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