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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

September / October 2023 Supplementary Examinations

Programme: B.E. **Semester: IV**
Branch: ES CLUSTER(EC/EE/ET/EI/ML) **Duration: 3 hrs.**
Course Code: 19ES4CCLIC **Max Marks: 100**
Course: Linear Integrated Circuits

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

UNIT - I

1 a) With a neat diagram and waveforms, explain the working of a precision half wave rectifier? What are the additional components required to make it a full wave rectifier? **08**

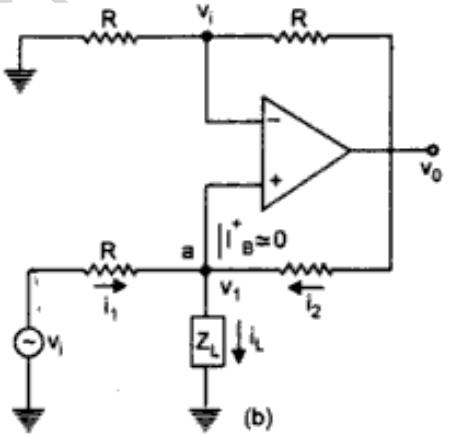
b) IC 741 is used as an inverting amplifier with a gain of 100.The voltage gain vs frequency characteristic is flat upto 10kHz. (a) Determine the maximum peak to peak input signal that can be applied without any distortion to the output. (b) Assuming slew rate for 741 is 0.5 V/μs, what is the maximum undistorted sine wave that can be obtained for (a)12V peak **06**

c) Identify a suitable circuit to measure the amount of current generated by a photo cell in terms of voltage. Describe the working of circuit along with output equation. **06**

OR

2 a) Explain the following (a) Input bias current (b) Input offset current (c) Slew rate (d) Bandwidth with ideal values for 741 op-amp **08**

b) For the circuit shown in the fig, derive the expression for transconductance g_m **06**



c) For the non inverting amplifier, find A_f, R_{if}, R_{of}, BW_f if A=2,00,000, R_i = 2MΩ, R_o = 75Ω, R_f=10MΩ, BW = 5Hz. Draw the circuit. **06**

UNIT - II

3 a) With a neat diagram, input/ output waveforms and transfer characteristics, explain Schmitt Trigger. **08**

b) Derive the equation for Period & frequency of oscillation in Astable multivibrator **06**

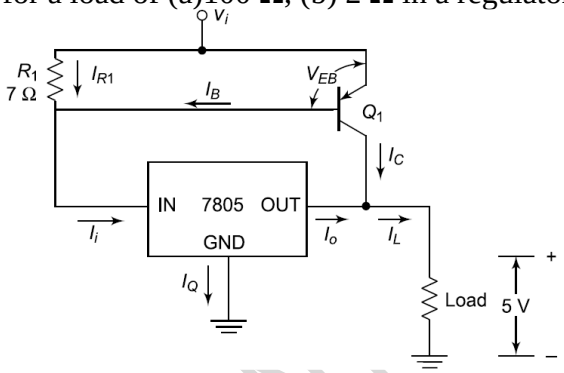
c) What are the conditions for sustained oscillation? Explain RC phase shift oscillator, with a neat circuit diagram **06**

UNIT - III

4 a) With a neat circuit diagram, explain Series op-amp regulator **08**

b) Design a second order low pass Butterworth filter with a cutoff frequency of 10kHz and unity gain at low frequency. Also determine the voltage transfer function magnitude in dB at 12kHz for the filter. Draw the circuit and frequency response. **06**

c) Assume V_{EB} (ON) = 0.7 V and β = 50. Determine the output current I_o and I_c for a load of (a)100 Ω, (b) 2 Ω in a regulator circuit shown in the figure below. **06**



UNIT - IV

5 a) With a neat diagram, explain the working of counter type ADC. Also mention its advantages and disadvantages **08**

b) An 8 bit ADC accepts an input voltage signal of range 0 to 10 V. **06**
a. What is the minimum value of i/p voltage required to generate a change of 1 LSB?
b. What input voltage will generate all 1s at the A/D converter o/p?
c. What is the digital o/p for an applied i/p voltage of 4.8V?

c) A dual slope ADC uses a 16-bit counter and a 4 MHz clock rate. The maximum input voltage is +10V. The maximum integrator output voltage should be -8V when the counter has cycled through 2^n counts. The capacitor used in the integrator is 0.1μf. Find the value of the resistor R of the integrator. **06**

OR

6 a) Design a R-2R DAC circuit to obtain seven step downward staircase waveform to get a step size of 1V. Write its truth table and output waveform. **08**

b) Consider the R-2R inverting 4 bit converter and assume that feedback resistance R_f of the op amp is variable. The resistance R = 10kΩ and V_R = 10V. Determine the value of R_f that should be connected to achieve the following o/p conditions. **06**

a. The value of an LSB at the o/p is 0.5 V
b. An analog o/p of 6V for a binary i/p of 1000
c. The maximum full scale o/p of 10 V

c) Design a 2 bit weighted resistor DAC to get a step size of 2 V and write its truth table. If you are giving inputs from a counter, write its output and describe the waveform **06**

UNIT - V

7 a) Derive the expression for T_{ON}, T_{OFF} & T in an Astable multivibrator using 555 timer **08**

b) With a neat block diagram, explain the working principle of PLL **06**

c) Discuss the application of PLL as a multiplier/divider **06**

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