

BITS, PILANI - DUBAI
DUBAI INTERNATIONAL ACADEMIC CITY, DUBAI
III-Year I- Semester 2007- 2008
COMPREHENSIVE EXAMINATION (Closed Book)
COURSE TITLE: ANALOG ELECTRONICS (EEE UC364)

TIME: 3 Hours

Date: 26-12-2007

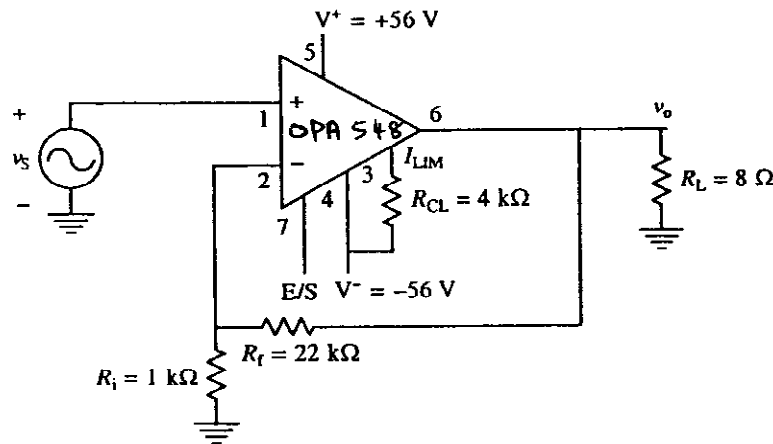
MARKS: 60

NOTE:

- i. Answer all Questions, all questions carry equal marks..
- ii. Assume any missing data suitably and mention explicitly
- iii. Answer all parts of question in continuation
- iv. Do not leave any blank page in between the answers

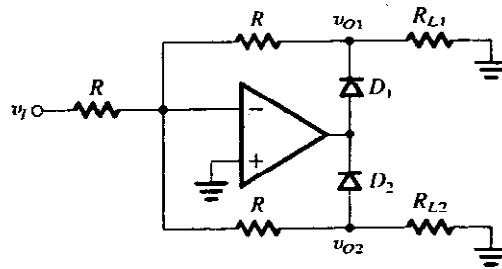
- 1) (i) An analog signal in the range 0 to +1V is to be converted to a 3-bit digital signal.
- a) Determine the resolution of the conversion in volts.
 - b) Represent graphically input Vs output (all combinations).
- (ii) What is the maximum resistor ratio required by a 12-bit D/A converter using binary weighted resistors? [8 Marks]

- 2) For the given circuit, calculate the gain. Plot the output for a peak sinusoidal input of 2V. Output current limit for OPA548 = $(15\text{k}\Omega)(4.75)/(13.75\text{k}\Omega + R_{CL})$ [7 Marks]

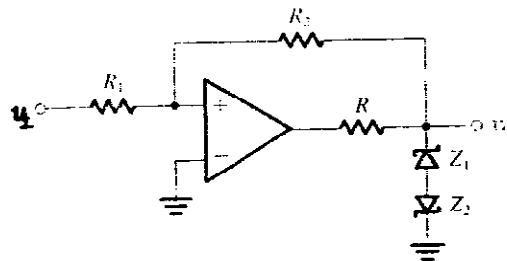


- 3) Draw internal circuit of 555 timer. If threshold and the trigger input terminals are connected to an input voltage v_1 (varies from 0 – 15 V and 15 to 0V), draw the transfer characteristics. Explain. [7 Marks]
- 4) Design a high voltage regulator using IC 723 to get an output voltage of 25V. Choose $R_2 = 2.2\text{k}\Omega$. Also design a current limit circuit to limit the current to 60mA. [7 marks]

- 5) (a) Draw a neat sketch of delay equalizer in which output leads input.
 (b) Plot the transfer characteristics $v_{o1}-v_i$ and $v_{o2}-v_i$ of the circuit in figure.
 Explain the working of the circuit. [8 marks]



- 6) (a) What is a pressure sensor? Explain briefly different types of sensors in pressure sensors?
 (b) An ultrasonic sensor emits a sound beam in a beam angle cone that eliminates side lobes. Target size versus beam spot size is important. Theoretically the smallest detectable target is one half of the wave length of the ultrasonic signal. Targets usually are larger and are sensed at various distances. If the area covered by the ultrasonic signal is 132mm and the ultrasonic beam angle is 10° find the distance of target from the sensor. [7 Marks]
- 7) (a) Explain the working of an isolation amplifier using optical isolation with a neat sketch.
 (b) Design the following circuit to realize a transfer characteristic with $\pm 7.5V$ output levels and $\pm 7.5V$ treshold values. Design so that when $v_i = 0V$ a current of 0.1mA flows through the zener diodes. Assume that the output saturation levels of the op-amp are $\pm 12 v$. specify the voltages of the zener diodes and give the values of all resistors. [8 marks]



- 8) A coil having an inductance of $10\mu H$ is intended for applications around 1- MHz frequency. Its Q is specified to be 200. Find the equivalent resistance R_p . What is the value of the capacitor required to produce resonance at 1- MHz frequency? What additional parallel resistance is required to produce a 3-dB bandwidth of 10kHz? [8 marks]

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III-Year I- Semester 2007- 2008
TEST – II (Open Book)

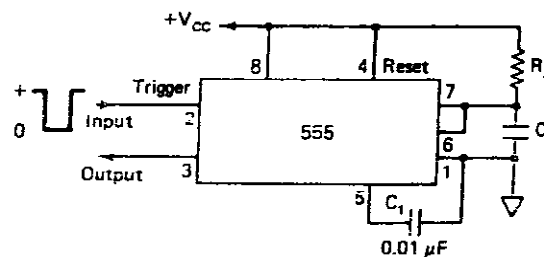
COURSE NO: EEE UC364
TIME: 50 minutes

Date: 18-11-07

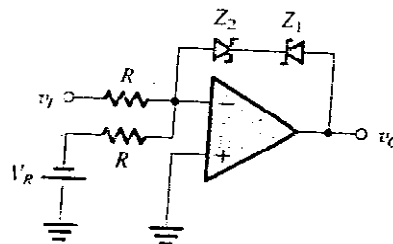
COURSE TITLE: ANALOG ELECTRONICS
MARKS: 20 **WEIGHTAGE:(10%)**

NOTE: (Answer all Questions, Data provided are complete)

- 1) In the following circuit, frequency of input trigger signal is 2 kHz. If the value of $C = 0.01\mu\text{F}$ and the circuit is to be used as a divide by 3(frequency) network, what should be the value of R_A ? Draw input and output waveforms marking all values clearly for at least one cycle of output. [5 marks]

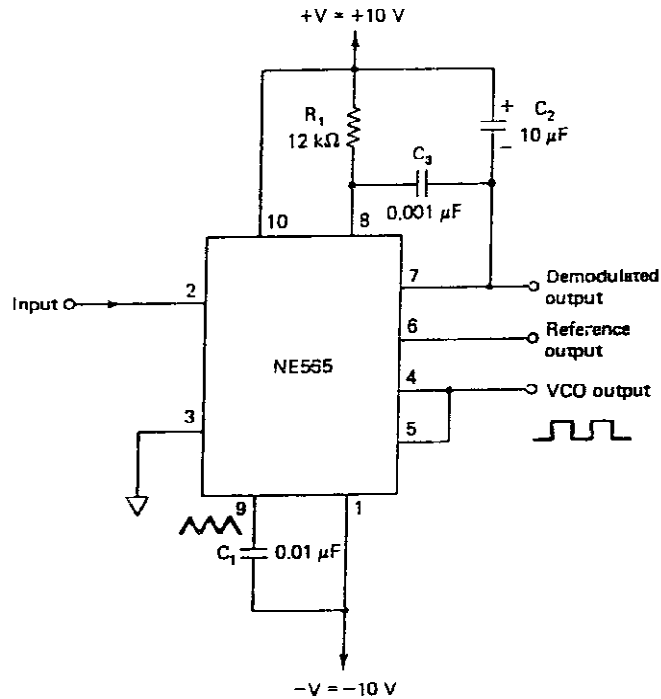


- 2) Denoting the zener voltages of Z_1 and Z_2 by V_{Z1} and V_{Z2} and assuming that in the forward direction the voltage drop is approximately 0.7 V, sketch and clearly label the transfer characteristics v_o-v_i of the circuits given. Assume the op amps to be ideal. [5 marks]



- 3) Refer the given circuit and determine the free running frequency f_{out} , the lock range f_l , and the capture range f_c . Using a neat sketch show the relationship between f_{out} , f_l and f_c . (Clearly mark all frequencies)

[5 marks]



- 4) (a) What is Q for a band pass filter which has $f_L = 200$ Hz and $f_H = 1$ kHz
- (b) What is the value of input and feedback resistance for a band pass filter for which pass band gain = 4? Explain.
- (c) Draw the frequency response plot of a second order high pass Butterworth filter for $f = 100$ Hz, 700 Hz, 1 kHz, 7 kHz. It is given $f_L = 1$ kHz

[5 marks]

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III-Year I- Semester 2007- 2008

TEST – I (Closed Book)

COURSE NO: EEE UC364

TIME: 50 minutes

Date: 30-09-07

COURSE TITLE: ANALOG ELECTRONICS

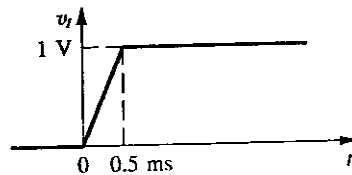
MARKS: 20

WEIGHTAGE:(10%)

NOTE: (Answer all Questions, Data provided are complete)

- 1) An integrator incorporates an ideal op amp, a resistor R of $100\text{k}\Omega$ and a capacitor C of 10nF . A sine wave signal is applied to it's input.
 - a. At what frequency (in Hz) are the input and output signals equal in amplitude?
 - b. If the frequency is lowered by a factor of 10 from that found in (a), by what factor does the output voltage change and is it increasing or decreasing? [4 marks]

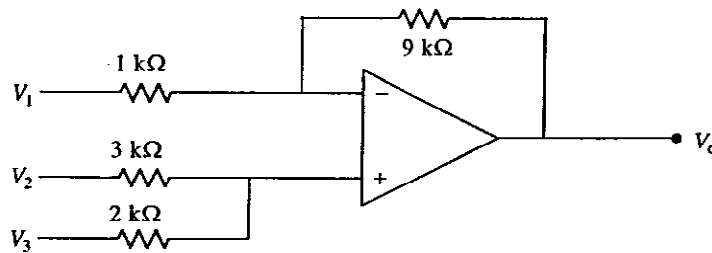
- 2) An op-amp differentiator with 1ms time constant is driven by the rate controlled step shown in figure. Assuming v_o to be zero initially, sketch and label it's output waveform. [4 marks]



- 3) For an amplifier having a slew rate of $60\text{V}/\mu\text{s}$, what is the highest frequency at which a 20V peak-to-peak sine wave can be produced at the output? [4 marks]

[P.T.O]

- 4) Find an expression for V_o in the following circuit. Consider the op amp as ideal. [4 marks]



- 5) Find an expression for V_o in the following circuit. Identify the operation performed by the circuit. [4 marks]

