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EE56

Fifth Semester B.E. Degree Examination, June / July 08
Operational Amplifier and Linear IC's

Time: 3 hrs. Max. Marks:100

Note : *1. Answer any FIVE full questions.*
2. Use of resistor and capacitor standard values list and OPAmp data sheets are permitted.
3. Missing data may be suitably assumed.

1 a. With a circuit diagram, explain the operation of a high Input – Impedance capacitor – coupled non – inverting amplifier. **(08 Marks)**

b. A capacitor – coupled inverting amplifier has the following components ; $R_1 = 2.7\ k\Omega$, $R_2 = 100k\Omega$, $R_L = 1.5\ k\Omega$, $C_1 = 3.9\mu F$, $C_2 = 0.68\mu F$. Determine the circuit voltage gain, lower cut – off frequency and impedance of C_1 at f_1. Draw the circuit and insert the given values. **(06 Marks)**

c. With a neat circuit diagram, show how a capacitor – coupled voltage follower should be used with a single polarity supply. Briefly explain the circuit operation. **(06 Marks)**

2 a. What are the effects of Load capacitance on Op-Amp circuit stability? Give the methods of compensating for the load capacitance effect. **(08 Marks)**

b. What are the effects of slew – rate on Band – width, out – put pulse rise time and output amplitude? **(06 Marks)**

c. List the precautions that should be observed for operational Amplifier circuit stability. Briefly explain. **(06 Marks)**

3 a. With a neat diagram, show how a half – wave precision rectifier can be combined with summing circuit to produce a full wave precision rectifier. Draw the voltage waveforms and justify with equations how full wave rectification is performed. **(10 Marks)**

b. Design a non – saturating precision half wave rectifier using a bi-polar OP-Amp with supply voltage of $\pm 20V$, to produce a 3V peak output. The input signal has a 1V peak amplitude and a frequency of 50 kHz. **(05 Marks)**

c. With a neat diagram, explain a clamping circuit using an Op-Amp. **(05 Marks)**

4 a. Draw an OP-Amp non – inverting Schmitt trigger circuit and explain its operation. Also explain how trigger points can be adjusted. **(10 Marks)**

b. Using a bi-polar OP-Amp, design an inverting Schmitt trigger circuit to trigger at $\pm 0.5V$ and produce an output of approximately $\pm 11V$. **(05 Marks)**

c. With a neat circuit diagram and wave forms explain the operation and design procedures for an astable multivibrator. **(05 Marks)**

5 a. With a neat circuit diagram, explain the operation of Triangular/Rectangular waveform generator. Explain how frequency and duty – cycle can be controlled in the circuit. **(12 Marks)**

b. Using 741 OP-Amp, with a supply of $\pm 9V$, design an RC – phase shift oscillator to have output frequency of 10 kHz. Draw the circuit and insert the values. **(08 Marks)**

6 a. What is the difference between wide band and narrow – band pass filters? Draw the circuit diagrams and typical frequency responses for each. Briefly explain. **(10 Marks)**

b. Design a low –pass filter at a cut-off frequency of 1kHz with a pass band gain of 2. Using frequency scaling convert 1kHz cut-off frequency of low – pass filter to a cut – off frequency of 1.6 kHz. **(10 Marks)**

7 a. Explain with a block diagram, Universal active filter. How can it be realized as a second order Low pass, High pass and Band pass filter? **(10 Marks)**

b. With a neat sketch, explain the basic circuit of 723 integrated circuit DC – voltage regulator. Show how it can be used as positive voltage regulator. **(10 Marks)**

8 Write short notes on:

a. Voltage follower regulator.

b. Phase Locked Loop

c. Wein bridge oscillator with oscillator amplitude stabilization

d. Peak detectors. **(20 Marks)**

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