

# CBCS SCHEME

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15EE46

## Fourth Semester B.E. Degree Examination, Dec.2018/Jan.2019 Operational Amplifiers and Linear IC's

Time: 3 hrs.

Max. Marks: 80

**Note: Answer any FIVE full questions, choosing  
ONE full question from each module.**

### Module-1

- 1 a. With a neat block diagram, explain the general stages for an op-amp. (08 Marks)  
b. Explain the effect of feedback as input resistance ( $R_i$ ) and output resistance for voltage shunt amplifier. (08 Marks)

**OR**

- 2 a. Define the following terms :  
i) input offset voltage  
ii) input offset current  
iii) PSRR  
iv) CMRR. (08 Marks)  
b. The circuit of peaking amplifier is to provide a gain of 10 at a peak frequency of 16KHz. Determine the value of all components. (08 Marks)

### Module-2

- 3 a. Using a 741 op-amp, design the first order active low pass filter to have a 1.0 KHz cut off frequency. (06 Marks)  
b. Sketch the circuit of a second order active low pass active filter and explain its operation. (10 Marks)

**OR**

- 4 a. For a voltage regulator define.  
i) Line regulation  
ii) Load regulation  
iii) Ripple rejection. Write equation for each. (06 Marks)  
b. Explain the working and design to op-amp voltage follower regulator. (10 Marks)

### Module-3

- 5 a. Draw the circuit diagram of a triangular/rectangular waveform generator using op-amps. Sketch the circuit waveforms and explain its circuit operation. (10 Marks)  
b. Design a triangular waveform generator to produce a  $\pm 2V$  1KHz output. Use a  $\pm 15V$  supply assume  $I_1 = 100\mu A$ . (06 Marks)

OR

- 6 a. Explain the working of Schmitt trigger in inverting mode. Draw its hysteresis curve. (06 Marks)
- b. State the Barkhausen criteria for a sine wave oscillator. Draw the circuit diagram of an op-amp phase shift oscillator. Sketch the circuit wave forms and briefly explain the oscillator operation. (10 Marks)

**Module-4**

- 7 a. Show how a half wave precision rectifier can be obtained with a summing circuit to produce a full wave precision rectifier. Draw the voltage wave forms and write the equation to show that full-wave rectification is performed. (10 Marks)
- b. Explain the working of R-2R ladder DAC. Assume that binary input is 001. (06 Marks)

OR

- 8 a. Design a precision full wave rectifier circuit to produce a 2V peak output from a sinewave input with a 0.5Vp value and 1MHz frequency. Use bipolar op-amp with a supply voltage of  $\pm 15V$ . Assume  $I_1 = 500\mu A$ . (08 Marks)
- b. Sketch an op-amp precision clamping circuit draw the input and output waveforms and explain the circuit operation. Show how the output voltage can be biased to any desired level. (08 Marks)

**Module-5**

- 9 a. Draw the basic block diagram and waveforms for a PLL system. Identify each component part and explain its function. (08 Marks)
- b. Draw the block diagram for a PLL frequency synthesizer. Sketch all waveforms and explain the system operation. (08 Marks)

OR

- 10 a. Sketch the basic circuit diagram of an astable multivibrator using 555 timer with two resistances and a capacitor. Show the capacitor and output waveforms and explain the circuit operation. (08 Marks)
- b. Sketch the functional block diagram for a 555 IC timer. Identify all terminals and explain each component part. (08 Marks)

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