***U.S.N*** | | | | | | | | | | |

# P.E.S. College of Engineering, Mandya - 571 401

***(An Autonomous Institution affiliated to VTU, Belagavi)***

**Fourth Semester, B.E. - Electronics and Communication Engineering**

**Semester End Examination; June - 2017**

**Operational Amplifier and Applications**

*Time: 3 hrs* *Max. Marks: 100*

***Note**: Answer **FIVE** full questions, selecting **ONE** full question from each unit.*

## UNIT - I

1 a. Draw the basic operational amplifier circuit. Explain. 7

b. A 741 op-amp is used in a non-inverting amplifier with a voltage gain of 50. Calculate the typical output voltage that would result from a common mode input with a peak level of 100 mV. 6

c. Sketch an illustration to show the effect of operational amplifier slew rate. Explain state a typical op-amp slew rate. 7

2 a. Design an inverting amplifier using 741 op-amp, the voltage gain is to be 50 and the output voltage amplitude is to be 2.5 V. 7

b. Design an inverting summing amplifier to give the direct sum of two inputs which each range from 0.1 V to 1 V. Use 741 op-amp. 6

c. Sketch the circuit of a capacitor-coupled non-inverting amplifier. Explain the circuit operation. 7

## UNIT - II

3 a. Discuss the upper cutoff frequency of an op-amp circuit and show how the cut-off frequency can be set for inverting and non-inverting amplifier? 10

b. Explain operational amplifier circuit stability and show how feedback in an inverting amplifier can produce instability? Explain the conditions necessary for oscillations to occur in an op-amp circuit. 10

4 a. Explain the following frequency compensation methods :

i) Phase-log ii) Phase-leaf iii) Miller-effect. 10

b. Calculate the slew rate-limited cutoff frequency for a voltage follower circuit using a 741 op-amp, if the peak of sine wave output is to be 5 V. Determine the maximum peak value of the sinusoidal output voltage that will allow the 741 voltage follower circuit to operate at the 800 kHz unity-gain cut-off frequency. 4

c. List the precautions that should be observed for operational amplifier circuit stability. 6

Contd….2

**UNIT - III**

5 a. Sketch the circuit of a low-resistance voltage source using an op-amp as a bipolar transistor. Show how a Zener diode is used to determine the output voltage? Explain. 7

b. Show how current to voltage converter should be modified to function as a current amplifier/attenuator with a ground load? Explain the operation of the amplifier/attenuator and derive an equation for current gain. 7

c. Design a non saturating precision half-wave rectifier to produce a 2 V peak output from a sine wave input with a peak value of 0.5 V and frequency of 1 MHz. Use a bipolar op-amp with a supply voltage of ±15 V. 6

6 a. A ±5 V, 10 kHz square wave from a signal source with a resistance of 100 Ω is to have its positive peak clamped precisely at ground level. Tilt on the output is not to exceed 1% of the peak amplitude of the wave. Design a suitable op-amp circuit. Use a supply of ±12 V. 8

b. Explain voltage follower type peak detector circuit operation. 8

c. What is sample and hold circuit? Write the waveform for the same. 4

**UNIT - IV**

7 a. With circuit diagram and wave form, describe the working principle of triangular/rectangular wave generator. 10

b. Draw the circuit of a Wein bridge oscillator. Sketch the output and feedback voltage waveform and explain the circuit operation. 10

8 a. Using a 741 op-amp with a supply of ±12 V, design a inverting Schmitt trigger circuit to have trigger points of ±2 V. 6

b. Discuss the design process for an op-amp monostable multivibrator and write the equations for calculating each component value. 8

c. Explain how the filters are classified? 6

**UNIT - V**

9 a. Describe the operation of op-amp series voltage regulator. 10

b. Explain the working operation of 723 general purpose regulators. 10

10 a. What is PLL? Explain. 7

b. Describe the working principal of VCO. 7

c. Explain the operation of A/D converter. 6

* * * *