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

(An Autonomous Institution affiliated to VTU, Belgaum)

Fifth Semester, B.E. - Electrical and Electronics Engineering

Semester End Examination; Dec - 2016/Jan - 2017

Operational Amplifiers and Linear Integrated Circuits

Time: 3 hrs *Max. Marks: 100*

***Note**: i) Answer **FIVE** full questions, selecting **ONE** full question from each unit.*
ii) Use of resistor and capacitor standard values list and Op-amp data sheets are permitted.

UNIT - I

1 a. With a neat circuit diagram, design a high Z_{in} capacitor coupled voltage follower. Obtain the expression for input impedance of the circuit. 10

b. Design a capacitor coupled inverting amplifier to operate with a ± 20 V supply. The minimum input signal level is 50 mV, the voltage gain is to be 68, the load resistance is 500 Ω, the lowest cutoff frequency is to be 200 kHz. Use 741 Op-Amp (I_{Bmax} = 5000 nA). 8

c. How do you set the upper cutoff frequency for an inverting amplifier? 2

2 a. Explain the design of a capacitor coupled voltage follower and write the equations for finding circuit components. 8

b. A capacitor coupled non-inverting amplifier is to have an A_v = 90 and V_0 = 3 V. The load resistance is 10 kΩ, and lower cutoff frequency is to be 70 Hz. Design a suitable circuit using 741 Op-Amp (I_{Bmax} = 500 nA). 8

c. Draw the circuit for a difference amplifier and write the equations for X_{C1}, X_{C2} and X_{C3}. 4

UNIT - II

3 a. What is frequency compensation? Mention the condition for system stability. 4

b. Explain Miller effect compensation. 8

c. Define slew rate and derive an expression for maximum/peak value of sine wave output voltage. 8

4 a. Discuss the method of compensating for stray capacitance with relevant circuit diagram and equations. 6

b. Discuss Z_{in} Mod compensation technique of frequency compensation with relevant circuit diagram and equations. 8

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

UNIT - III

5 a. Sketch an Op-Amp precision full wave rectifier circuit. Draw its input and output waveforms. Explain the circuit operations. 6

b. Draw an Op-amp based sample and hold circuit. Draw its input, control and output waveforms. Explain circuit operations. 8

Contd…2

c. Design a non saturating precision half wave rectifier to produce a 2 V peak output from a sign 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. State the Bark Hausen criteria and explain how it is fulfilled in the RC phase shift oscillator? 8

b. Draw the circuit of a Wein Bridge oscillator. Sketch the output and feedback voltage waveforms and explain the circuit operation. 6

c. Using a BIFET Op-amp with a supply of ±12 V, design a Wein Bridge oscillator to have an output frequency of 15 kHz. 6

UNIT - IV

7 a. Discuss the circuit operation and design of an Inverting Schmitt trigger circuit. Explain the means of adjusting the trigger points in such a circuit. 10

b. Draw the circuit of an Op-Amp Mono-Stable Multi-Vibrator. Show the relevant voltage waveforms and explain its operation. 10

8 a. Draw the circuit of :

i) First order, Low pass and first order, High pass filters 12

ii) Second order, Low pass and second order High pass filters.

b. Discuss the single stage first order band pass filters with relevant circuit diagrams and equations. 8

UNIT - V

9 a. Explain precision voltage regulator working with a neat diagram. 8

b. Draw the relevant sketch and explain the operation of a universal active filter. 6

c. Sketch the basic circuit of a 723 IC voltage regulator and explain. 6

10 a. Explain briefly the class A and class B power amplifier with neat circuit and wave forms. 10

b. Briefly explain the operation of switched capacitor filter and mention the advantages of the same. 10

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