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P.E.S. College of Engineering, Mandya - 571 401
(An Autonomous Institution affiliated to VTU, Belagavi)
Third Semester, B.E. - Electronics and Communication Engineering
Semester End Examination; March - 2021
Analog Electronic Circuits

Time: 3 hrs *Max. Marks: 100*

Course Outcomes
The Students will be able to:
*CO1 - **Apply** the knowledge of physics to describe the operation and characteristics of Op-Amps.*
*CO2 - **Discuss** the working of op-amp applications, signal generators, voltage regulators, ADC, DAC and PLL.*
*CO3 - **Analyze** the frequency response, stability and applications of op-amps.*
*CO4 - **Design** the different op-amp applications circuits, signal generators, voltage regulators, ADC, DAC for a given specifications.*
*CO5 - **Work** as individual or in groups to model different op-amp circuits using simulation tools.*

<u>*Note:*</u> I) PART - A *is compulsory.* **Two** *marks for each question.*
  II) PART - B: *Answer any* <u>**Two**</u> *sub questions (from a, b, c) for Maximum of **18 marks** from each unit.*

Q. No.	Questions	Marks	BLs	COs	POs
	I : PART - A	**10**			
I a.	Define PSRR.	2	L1	CO1	PO1
b.	Mention the frequency compensation methods.	2	L1	CO1	PO1
c.	Draw the circuit diagram of negative precision rectifier.	2	L1	CO1	PO1
d.	What should be the value of gain and the total phase shift around a loop of RC phase shift oscillator circuit?	2	L1	CO2	PO2
e.	Define lock range and capture range related PLL.	2	L1	CO1	PO1
	II : PART - B	**90**			
	UNIT - I	**18**			
1 a.	Design op-amp non-inverting amplifier with a voltage gain of 50 to produce an output voltage of 2 V.	9	L3	CO3	PO3
b.	With a circuit and design steps, explain the operation of high input impedance capacitor coupled voltage follower.	9	L2	CO2	PO2
c.	Sketch an op-amp circuit to output inverted amplified sum of two input voltages. Design this circuit to give sum of the two inputs which each ranges from 0.5 V to 1 V and the gain of the circuit is 2.	9	L2	CO2	PO2
	UNIT - II	**18**			
2 a.	Describe the concept of frequency compensation and with a neat diagram, explain how compensation is provided internally?	9	L2	CO2	PO2
b.	Sketch the circuit of precision voltage source with Zener diode and design it to provide the output of 12 V. The available supply is ±15 V. Provide the arrangement for ±5% tolerance of Zener diode voltage.	9	L2	CO3	PO3
c.	With a neat circuit diagram, explain the operation of inverting Schmitt trigger. Using 741 op-amp with a supply voltage of ±12 V, design a inverting Schmitt trigger circuit to have trigger points of UTP = 0 V and LTP = −1 V.	9	L3	CO4	PO3

<div align="center">**UNIT - III**</div>   18

3 a. With a neat circuit, explain the working of full wave precision rectifier with input and output wave forms and with necessary equations.   9   L2 CO2 PO2

   b. Explain the operation of sample and hold circuit and discuss its performance parameters.   9   L2 CO2 PO2

   c. Explain operation of 555 Timer as an astable multivibrator. Design an astable multivibrator using 555 timer IC to generate a symmetrical square wave of 2 kHz with 50% duty cycle, assuming C = 0.1 µF.   9   L3 CO3 PO3

<div align="center">**UNIT - IV**</div>   18

4 a. With a neat sketch, explain the operation in Triangular / Rectangular wave generator circuit and write the expressions for;

   i) Peak to Peak amplitude of the Triangular wave   9   L2 CO2 PO2

   ii) The time taken by the output to swing from $-V_{ramp}$ to $+V_{ramp}$

   iii) Frequency of oscillation

   b. Sketch feedback network in RC phase shift oscillator and discuss its significance. Design phase shift oscillator to have output frequency of 500 Hz. Use ±12 V supply.   9   L2 CO3 PO3

   c. Explain the operation of adjustable output regulator and design this circuit for the following specifications:

   $V_i = (18\pm3)$ V, $V_0 = 9$ V at $I_0 = 10$ to 50 mA; Zener Voltage, $V_Z = 5.6$ V and   9   L2 CO3 PO3

   $I_{Z(min)} = 5$ mA.

<div align="center">**UNIT - V**</div>   18

5 a. Write an expression for the output voltage of inverted R / 2R ladder D / A converter. Explain its operation and also mention the advantages of this DAC.   9   L2 CO2 PO2

   b. With a neat diagram, waveform and analysis, explain the operation of dual slope, integrator ADC. Also mention its advantages and disadvantages.   9   L2 CO2 PO2

   c. Explain the operation of basic PLL system with block diagram and waveforms.   9   L2 CO2 PO2

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