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Course Code 

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Third Semester B.E. Degree Examinations, September / October 2024

**Analog Electronic Circuits & Op-Amps**

Duration: 3 hrs

Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.  
2. Missing data, if any, may be suitably assumed

<u>Q. No</u>	<u>Question</u>	<u>Marks</u>	<u>(RBTL:CO:PI)</u>
<b>MODULE – 1</b>			
1.	a. Draw a double diode clipper, which limits at two independent levels and explain its operation. Also draw the input and output waveforms.	08	(3 :1 : 1.4.1)
	b. Draw a positive clamper circuit and explain its operation. Also draw the input and output waveforms.	08	(3 :1 : 1.4.1)
	c. Design the clamper circuit for the given input and output waveforms as shown in Fig.Q1(c).	04	(3 :1 : 1.4.1)

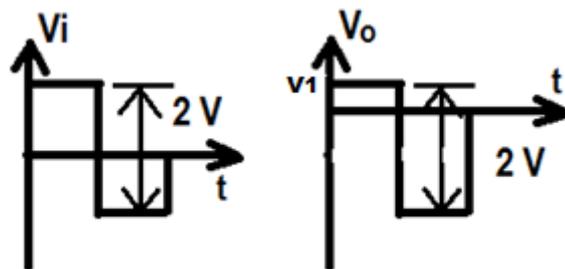


Fig.Q1(c)

OR

2.	a. Derive an expression for $E_{th}$ , $I_B$ and $V_{CE}$ for voltage divider bias circuit using exact analysis.	06	(3 :1 : 1.4.1)
	b. Derive the expression for current gain, voltage gain, input impedance and output impedance for an emitter follower circuit.	07	(3 :1 : 1.4.1)
	c. Design a voltage divider bias circuit for the specified condition $V_{CC} = 12V$ , $V_{CE} = 6V$ , $I_C = 1mA$ , $S(I_{CO}) = 20$ , $\beta = 100$ , $V_E = 1V$ .	07	(3 :1 : 1.4.1)

**MODULE – 2**

3.	a. Explain with the help of circuit, what is a cascade connection. Mention its advantages.	04	(2 :2 : 1.4.1)
	b. For a current series feedback amplifier, derive an expression for $Z_{if}$ and $Z_{of}$ ?	08	(3 :2 : 1.4.1)
	c. Prove that how band width of an amplifier increases with negative feedback?	08	(3 :2 : 1.4.1)

OR

4.	a. With neat block diagram, explain Barkhansen criteria to obtain sustain oscillations.	06	(2 :2 : 1.4.1)
	b. With basic circuit, derive the expression for the frequency of oscillations of a Wien Bridge Oscillator.	08	(3 :2 : 1.4.1)

- c. A crystal has the following parameters  $L = 0.3344\text{H}$ ,  $C = 0.065\text{pF}$ ,  $C_M = 1\text{pF}$  and  $R = 5.5\text{K}\Omega$ . Calculate (i) Series Resonance frequency (ii) Parallel Resonance frequency. **06** (3 : 2 : 1.4.1)

**MODULE – 3**

5. a. Explain the operation of class B push-pull amplifier. Prove that the maximum efficiency of class B configuration is 78.5 %? **10** (2 : 3 : 1.4.1)
- b. Explain the operation of transformer coupled class A amplifier and prove that the maximum efficiency of class A amplifier is 50 %? **10** (2 : 3 : 1.4.1)

**OR**

6. a. Explain the construction, working and characteristics of an n-channel JFET? **10** (2 : 3 : 1.4.1)
- b. With neat sketch, explain the basic construction, operation and characteristics of n-channel depletion type MOSFET? **10** (2 : 3 : 1.4.1)

**MODULE – 4**

7. a. Mention the important characteristics of an Op-amp. **04** (2 : 4 : 1.4.1)
- b. With a neat diagram design an inverting and non-inverting summing amplifier and explain its operation. **08** (3 : 4 : 1.4.1)
- c. What is ZCD? Explain the design aspect of non-inverting ZCD using op-amp? **08** (3 : 4 : 1.4.1)

**OR**

8. a. With a neat circuit diagram and waveforms, explain the operation of non-inverting Schmitt trigger circuit with different UTP and LTP? **07** (3 : 4 : 2.1.2)
- b. Explain R-2R ladder digital to analog converter circuit? **07** (2 : 4 : 1.4.1)
- c. Using a bipolar op-amp with  $\pm 18\text{V}$  supply, design an inverting Schmitt trigger circuit to have  $\text{UTP} = 1.5\text{V}$  and  $\text{LTP} = -3\text{V}$ . **06** (3 : 4 : 2.1.2)

**MODULE – 5**

9. a. With a neat circuit diagram explain the working and design procedure of RC phase shift oscillator? **06** (3 : 5 : 1.4.1)
- b. With a neat circuit diagram explain Saw tooth wave Generator. **06** (2 : 5 : 1.4.1)
- c. Explain with neat circuit diagram triangular/rectangular wave generator? **08** (2 : 5 : 1.4.1)

**OR**

10. a. Explain the following performance parameters of voltage regulator (i) Line regulation (ii) Load regulation (iii) Ripple rejection **06** (2 : 5 : 1.4.1)
- b. With neat circuit diagram explain the operation of a voltage follower regulator using op-amp? **08** (2 : 5 : 1.4.1)
- c. Calculate the resistances  $R_1$  and  $R_2$  for the LM317 voltage regulator to produce an output voltage of 9V. Draw the circuit diagram? **06** (3 : 5 : 2.1.2)

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