# BALLARI INSTITUTE OF TECHNOLOGY \& MANAGEMENT <br> (Autonomous Institute under Visvesvaraya Technological University, Belagavi) 

USN $\square$ Course Code

| $\mathbf{2}$ | $\mathbf{1}$ | $\mathbf{E}$ | $\mathbf{E}$ | $\mathbf{3}$ | $\mathbf{3}$ |
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# Third Semester B.E. Degree Examinations, April/May 2023 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
Q. No

Question
MODULE-1

1. a. Draw a double diode clipper, which limits at two independent levels and explain its operation. Also draw the input and output waveforms.
b. Draw a positive clamper circuit and explain its operation. Also draw the 08
input and output waveforms. 08
(3:1:1.4.1)
c. Design the clamper circuit for the given input and output waveforms as

04 shown in Fig.Q1(c).


Fig.Q1(c)
OR
2. a. Derive an expression for $E_{t h}, I_{B}$ and $V_{C E}$ for voltage divider bias circuit 06 using exact analysis.
b. Derive the expression for current gain, voltage gain, input impedance and $\mathbf{0 7}$ output impedance for an emitter follower circuit.
c Design a voltage divider bias circuit for the specified condition $\mathrm{V}_{\mathrm{CC}}=\mathbf{0 7}$ $12 \mathrm{~V}, \mathrm{~V}_{\mathrm{CE}}=6 \mathrm{~V}, \mathrm{I}_{\mathrm{C}}=1 \mathrm{~mA}, \mathrm{~S}\left(\mathrm{I}_{\mathrm{CO}}\right)=20, \beta=100, \mathrm{~V}_{\mathrm{E}}=1 \mathrm{~V}$.

## MODULE-2

3. a. Explain with the help of circuit, what is a cascade connection. Mention $\mathbf{0 4}$ its advantages.
b. For a current series feedback amplifier, derive an expression for $Z_{i f}$ and $\mathbf{0 8}$ $\mathrm{Z}_{\mathrm{of}}$ ?
c. Prove that how band width of an amplifier increases with negative 08 feedback?

OR
4. a. With neat block diagram, explain Barkhansen criteria to obtain sustain 06 oscillations.
b. With basic circuit, derive the expression for the frequency of oscillations $\mathbf{0 8}$ of a Wien Bridge Oscillator.
c. A crystal has the follower parameters $\mathrm{L}=0.3344 \mathrm{H}, \mathrm{C}=0.065 \mathrm{pF}, \mathrm{C}_{\mathrm{M}}=$ 1 pF and $\mathrm{R}=5.5 \mathrm{~K} \Omega$. Calculate (i) Series Resonance frequency (ii) Parallel Resonance frequency.

## MODULE - 3

5. a. Explain the operation of class $B$ push-pull amplifier. Prove that the maximum efficiency of class B configuration is $78.5 \%$ ?
b. Explain the operation of transformer coupled class A amplifier and prove that the maximum efficiency of class A amplifier is $50 \%$ ?

## OR

6. a. Explain the construction, working and characteristics of an n-channel JFET?
b. With neat sketch, explain the basic construction, operation and characteristics of $n$-channel depletion type MOSFET?

## MODULE - 4

7. a. Mention the important characteristics of an Op-amp.
b. With a neat diagram design an inverting and non-inverting summing amplifier and explain its operation.
c. What is ZCD? Explain the design aspect of non-inverting ZCD using opamp?

## OR

8. a. With a neat circuit diagram and waveforms, explain the operation of noninverting Schmitt trigger circuit with different UTP and LTP?
b. Explain R-2R ladder digital to analog converter circuit?
c. Using a bipolar op-amp with $\pm 18 \mathrm{~V}$ supply, design an inverting Schmitt trigger circuit to have UTP $=1.5 \mathrm{~V}$ and $\mathrm{LTP}=-3 \mathrm{~V}$.

## MODULE - 5

9. a. With a neat circuit diagram explain the working and design procedure of $\mathbf{0 6}$ RC phase shift oscillator?
b. With a neat circuit diagram explain Saw tooth wave Generator.
c. Explain with neat circuit diagram triangular/rectangular wave generator?

## OR

10. a. Explain the following performance parameters of voltage regulator
(i) Line regulation (ii) Load regulation (iii) Ripple rejection
b. With neat circuit diagram explain the operation of a voltage follower regulator using op-amp?
c. Calculate the resistances $\mathrm{R}_{1}$ and $\mathrm{R}_{2}$ for the LM317 voltage regulator to $\mathbf{0 6}$ produce an output voltage of 9 V . Draw the circuit diagram?
