CBCS SCHEME

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21EE32

# Third Semester B.E. Degree Examination, Jan./Feb. 2023
## Analog Electronic Circuits and Op-Amps

Time: 3 hrs. Max. Marks: 100

**Note:** ***Answer any FIVE full questions, choosing ONE full question from each module.***





### Module-1

1 a. The parameters of voltage Divider Biasing circuit are as $V_{CC}$ = 16V, $R_1$ = 62KΩ, $R_2$ = 9.1KΩ, $R_c$ = 3.9KΩ, $R_E$ = 680Ω, β = 80 and $V_{BE}$ = 0.7V. Find the quiescent base current, collector current and $V_{CE}$. Also determine the values of collector voltage, Emitter voltage and base voltage with respect to ground. **(12 Marks)**

b. Draw and explain the working of clamper circuit which clamps the positive peak of a signal to zero. **(08 Marks)**

**OR**

2 a. Derive the expression for stability factor for voltage Divider Biasing circuit with respect to $I_{CO}$ and $V_{BE}$. **(10 Marks)**

b. Derive an expression for input impedance, output impedance, current gain and voltage gain for Emitter follower configuration. **(10 Marks)**

### Module-2

3 a. Explain the need of cascading Amplifier. Draw and explain the block diagram of three stage cascade amplifier. **(08 Marks)**

b. For the voltage series feedback Amplifier, derive an expression for transfer gain, input resistance and output resistance. **(12 Marks)**

**OR**

4 a. The parameters of Darlington Emitter follower configuration are as $V_{CC}$ = 18V, $R_B$ = 3.3μΩ, $R_E$ = 390Ω, $r_i$ = 5KΩ, $\beta_D$ = 8000 and $V_{BE}$ = 1.6V. Calculate Input and output impedances, voltage gain and current gain. Also draw its circuit diagram, Also find $V_0$ for $V_i$ = 120mV. **(12 Marks)**

b. For the current shunt feedback amplifier, derive an expression for Input resistance and output resistance. **(08 Marks)**

### Module-3

5 a. Explain the operation of class B pushpull amplifier. Prove that the maximum efficiency of class B configuration is 78.5%. **(10 Marks)**

b. With neat circuit diagram, explain working and characteristics of N-channel JFET. **(10 Marks)**

**OR**

6 a. Explain the operation of Class A transformer coupled power amplifier and prove that the maximum efficiency is 50%. **(10 Marks)**

b. With the help of neat diagrams, explain the construction, working and characteristics of N-channel Depletion type MOSFET. **(10 Marks)**

## Module-4

7 a. Design an active high pass filter to meet the following specification
   i) Butterworth response
   ii) Cutoff frequency = 6KHz and use $C_2 = C_3 = C = 1000PF$
   iii) Decay rate in the stop band = 40dB/decade
   Also draw the designed circuit diagram. **(10 Marks)**

b. Draw the practical voltage regulator using LM337 and justify the use of each component. Write three applications of IC LM337. **(10 Marks)**

**OR**

8 a. Design a second order low pass filter for cut-off frequency of 100Hz and draw its circuit diagram. **(10 Marks)**

b. What is Instrumentation Amplifier? Find the expression for output of three op-amp instrumentation Amplifier. **(10 Marks)**

## Module-5

9 a. Design the capacitor coupled zero crossing detector using op-amp 741 having $I_{B(max)} = 500nA$ and minimum signal frequency is 500Hz. The supply voltages are $\pm 12V$. Also draw the design circuit. **(12 Marks)**

b. Sketch the circuit of triangular/rectangular waveform generator. Draw the output waveforms from the circuit and explain its operation. **(08 Marks)**

**OR**

10 a. Design an inverting Schmitt trigger to have trigger voltages of $\pm 4V$. Use op-amp 741 with supply of $\pm 15V$. Draw the designed circuit. Write three differences between Schmitt trigger and comparator. **(12 Marks)**

b. Sketch the circuit of sawtooth wave generator. Draw its waveforms and explain its operation. **(08 Marks)**

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