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Total Pages : 4

Roll No.

011301

December 2023

B.Tech. (IT/CE(Hindi Medium)/CE/CSE/CSE(AIML))

III SEMESTER

Analog Electronics Circuits (ESC-301)

Time : 3 Hours]

[Max. Marks : 75

Instructions :

1. *It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.*
2. *Answer any four questions from Part-B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*

PART-A

1. (a) If the dc output voltage of a center tap full wave rectifier and bridge rectifier is 50 V. Calculate the peak inverse voltage in both cases. Assume diode is ideal. (1.5)
- (b) Define α and β , also find relationship between α and β . (1.5)
- (c) Which transistor parameters vary with temperature? (1.5)
- (d) Why is a FET known as a unipolar device? (1.5)

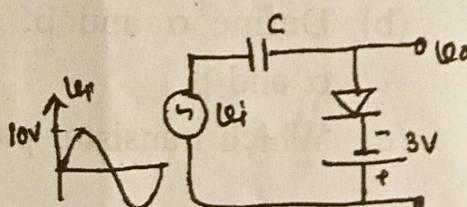
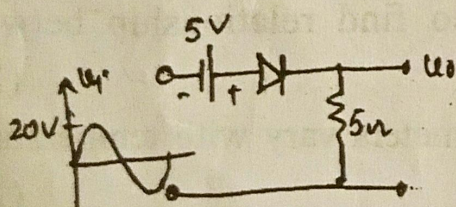
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[P.T.O.]

- (e) The differential voltage gain and CMRR of an operational amplifier when expressed in decibels are 110 dB and 100 dB respectively. Calculate the common mode gain. (1.5)
- (f) Explain the Barkhausen criteria for oscillations. (1.5)
- (g) Write down characteristics of an ideal operational amplifier. (1.5)
- (h) Differentiate between active and passive filters. (1.5)
- (i) Three R-C sections are used in RC phase shift oscillators, Why? (1.5)
- (j) Differentiate between Class A and Class B power amplifier. (1.5)

PART-B

2. (a) Draw the circuit diagram of bridge rectifier. Explain its working with proper waveforms. Derive the expression for (i) average dc output current (ii) rms output current (iii) ripple factor (iv) rectification efficiency (v) Peak inverse voltage. (7)
- (b) Draw the output waveforms for given circuits. Assume diode is ideal. (8)



3. (a) Draw the output characteristics of common base configuration and explain active, saturation and cut off regions in this output characteristics. (5)
- (b) A Common emitter amplifier uses voltage source having internal resistance $R_s = 800 \Omega$ and load resistance $R_L = 1000 \Omega$. The h parameters are $h_{ie} = 1 \text{ k}\Omega$, $h_{re} = 2 \times 10^{-4}$, $h_{fe} = 50$, $h_{oe} = 25 \mu\text{A/V}$. Calculate current gain A_i , Input impedance Z_i and Voltage gain A_v . (6)
- (c) A transistor is connected in CE configuration with a collector supply of 9 V, the voltage drop across R_C connected between collector and supply is 5 V. The value of resistance R_C is 500 ohms. Calculate base current with $\alpha = 0.96$, given $I_{CBO} = 1 \mu\text{A}$. (4)
4. (a) A NPN transistor circuit uses the voltage divider method of biasing has $\alpha = 0.985$ and $V_{BE} = 0.3 \text{ V}$, if $V_{CC} = 15 \text{ V}$, Calculate R_1 and R_C to place Q point at $I_C = 2 \text{ mA}$ and $V_{CE} = 4 \text{ V}$. The value of $R_E = 2 \text{ k}\Omega$ and $R_2 = 20 \text{ k}\Omega$. (9)
- (b) Draw the structure of N-channel FET and explain its operation. Also draw its V-I characteristics. Define pinch off voltage and show it on the V-I characteristics. (6)
5. (a) Draw the circuit diagram of wein bridge oscillator using operational amplifier. Explain its operation and find the frequency of oscillations. (6)

- (b) Draw and explain the following :
- (i) Precision rectifier.
 - (ii) Integrator.
 - (iii) Active low pass filter. (9)
6. (a) Draw and explain the circuit diagram of square wave generator with proper waveforms using operational amplifier. Also find the time period of generated wave. (8)
- (b) Explain the diagram of hysteretic comparator and zero crossing detector with their waveforms. (7)
7. Write short notes on the following :
- (i) Analog to digital converter.
 - (ii) Multistage amplifier.
 - (iii) Voltage regulator. (15)
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Dec., 2018

B.Tech. (EL/EEE/CE/IT/CSE) IIIrd Semester

ANALOGUE ELECTRONIC CIRCUITS

(ELPC302/ESC301)

Time : 3 Hours]

[Max. Marks : 75

Instructions :

- (i) It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.*
- (ii) Answer any four questions from Part-B in detail.*
- (iii) Different sub-parts of a question are to be attempted adjacent to each other.*
- (iv) Assume necessary relevant data if missing.*

PART-A

1. (a) Current flowing through a PN junction diode is called Reverse saturation current. Why? (1.5)
- (b) Define Peak Inverse voltage of a diode in rectifier circuit. Give its significance. (1.5)

(c) Why reverse saturation current is more in CE configuration as compared to CB configuration? (1.5)

(d) What do you mean by current mirror in BJT. (1.5)

(e) How does the current vary with gate voltage in saturation region of FET? (1.5)

(f) Compare small signal and large signal equivalent circuit of FET. (1.5)

(g) What do you mean by direct coupled amplifier? What are its applications? (1.5)

(h) Differentiate between voltage and power amplifier. (1.5)

(i) Define CMRR and slew rate, what should be their values. Justify your answer. (1.5)

(j) Differentiate between active and passive filters. What are the advantages of increasing order of a filter? (1.5)

PART-B

2. (a) Draw circuit diagram of a rectifier using two diodes and one load resistance and calculate (i) V_{dc} , (ii) V_{rms} (iii) Ripple factor and (iv) Rectification efficiency. (8)

(b) Draw outputs of the following circuits:

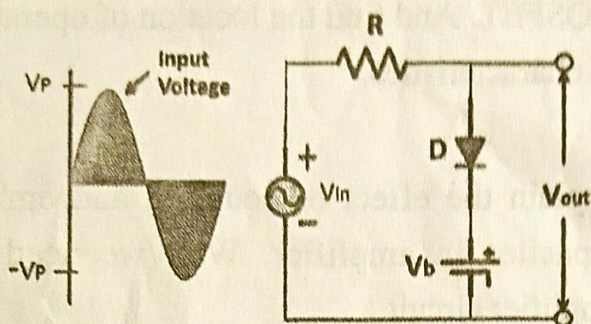


Figure 1

Clamping Networks

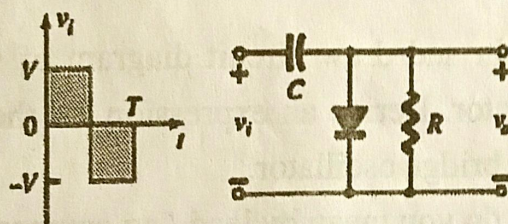


Figure 2

(7)

3. (a) Draw input and output characteristics curve of CB configuration of BJT. Indicate Active, cut off, saturation and breakdown regions. Explain the shape of curves qualitatively. (8)
- (b) Derive an expression for input resistance, current gain and voltage gain of CE amplifier. (7)
4. (a) Explain and draw output and transfer curve characteristics of enhancement type MOSFET. What you infer from these characteristics. Explain. (8)

- (b) Draw and explain potential divider biasing circuit for MOSFET. And find the location of operating point on its characteristics. (7)
5. (a) Explain the effect of coupling and emitter by pass capacitor in amplifier. Why we need both in an amplifier circuit. (8)
- (b) Explain characteristics of an ideal Op-Amp with their significance. Draw its transfer characteristics. (7)
6. (a) Explain and draw circuit diagram of a Wein bridge oscillator. Derive an expression for the frequency of Wein bridge oscillator. (8)
- (b) What do you mean by lead /lag compensator. Explain the circuit diagram and working of lead/lag compensator using Op-Amp. (7)
7. (a) Draw the diagram of triangular wave generator using Op-Amp. And find out the expression for the frequency of oscillations. (8)
- (b) Draw and explain circuit diagram and waveforms of zero crossing and peak detectors using Op-Amp. (7)
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December, 2019

**B.Tech.(CE/IT/CSE/EL/EEE) - III SEMESTER
ANALOG ELECTRONIC CIRCUITS
(ESC-301/ELPC-302)**

Time : 3 Hours]

[Max. Marks : 75

Instructions :

1. *It is compulsory to answer all the questions (1.5 marks each) of Part -A in short.*
2. *Answer any four questions from Part -B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*

PART - A

1. (a) Draw a negative waveform clipper circuit. (1.5)
- (b) What is a zener diode? (1.5)
- (c) Differentiate between full-wave rectifier and half-wave rectifier in terms of average current and voltages. (1.5)
- (d) What is the Q point? What is the importance of Q point? (1.5)

- (e) In BJT, the collector junction is reversed biased still a large current flow through it, explain how? (1.5)
- (f) Why the emitter follower circuit is called so? (1.5)
- (g) Explain the transconductance of a FET. (1.5)
- (h) What is input offset current and slew rate? (1.5)
- (i) What is the PID controller? (1.5)
- (j) Draw the circuit of the peak detector using OP-AMP. (1.5)

PART - B

2. (a) The four diodes used in a bridge rectifier circuit have forward resistance of 10Ω and load resistance of 480Ω . The alternating supply voltage is 240 V (RMS), calculate (i) DC load current (ii) DC power loss in all diode (iii) rectification efficiency (iv) ripple factor (v) Peak inverse voltage. (10)
- (b) Explain V-I characteristics of the diode and differentiate between static and dynamic resistance of a diode. (5)
3. (a) How MOSFET is different from BJT? With the help of a neat diagram, explain the construction, working and characteristics of n-channel enhancement type MOSFET. (10)

- (b) Draw the equivalent small-signal model and high-frequency equivalent model for CE configuration of a transistor amplifier. (5)
4. (a) Enumerate the various requirements for biasing a circuit. (3)
- (b) Deduce collector current, draw and explain input and output characteristics in the Common emitter configuration of a transistor. (6)
- (c) Draw and explain the input and output characteristics of the common source amplifier. (6)
5. (a) List the characteristics of an ideal OP-AMP. (3)
- (b) Differentiate between differential and common mode operation of an OP-AMP. Define CMRR and its significance. (6)
- (c) Design an adder circuit to get the output expression as $V_o = -[0.1V_1 + V_2 + 10V_3]$ (6)
6. (a) Draw and explain the integrator circuit using OP-AMP. Derive the expression for output voltage. (8)
- (b) Design a phase shift oscillator with a frequency of 100 Hz using OP-AMP. (7)

[P.T.O.]

7. (a) What are the advantages and features of the instrumentation amplifier? Derive the expression for the output voltage of instrumentation amplifier. (8)
- (b) What is the function of the precision rectifier circuit? What is the significance of UTP and LTP in Schmitt trigger circuit? (7)
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