

Enrollment No.....



Faculty of Engineering
End Sem (Odd) Examination Dec-2022
EC3CO03 Electronic Devices & Circuits

Programme: B.Tech.

Branch/Specialisation: EC

Duration: 3 Hrs.**Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d.

- Q.1 i. Which of the factors doesn't change the diode current? 1
 (a) Temperature
 (b) External voltage applied to the diode
 (c) Boltzmann's constant
 (d) Resistance
- ii. Efficiency of a centre tapped full wave rectifier is _____. 1
 (a) 81.2% (b) 50% (c) 46% (d) 70%
- iii. Comparing fixed and collector to base bias which of the following statement is true? 1
 (a) Fixed bias is more stable
 (b) Collector to base bias is more stable
 (c) Both are the same in terms of stability
 (d) Depends on the design
- iv. When the collector junction is reverse biased and emitter junction is forward biased, the operating region of the transistor is called _____. 1
 (a) Inverted region (b) Active region
 (c) Cut off region (d) Cut in region
- v. The constant current region of a JFET lies between- 1
 (a) Cut off and saturation (b) Cut off and pinch off
 (c) 0 and I_{dss} (d) Pinch off and breakdown
- vi. A JFET is a _____ driven device. 1
 (a) Current
 (b) Voltage
 (c) Both (a) and (b)
 (d) Partially current & partially voltage

P.T.O.


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- vii. Why is Darlington configuration not suitable for more than two transistors? **1**
 (a) Because leakage current increases and voltage gain decreases with multiple numbers of transistors
 (b) Because leakage current decreases and voltage gain increases with multiple numbers of transistors
 (c) Because leakage current as well as voltage gain increases with multiple numbers of transistors
 (d) Because leakage current as well as voltage gain decreases with multiple numbers of transistors
- viii. If output of transistor amplifier is 5 V and input of that amplifier is 250 mV then voltage gain will be- **1**
 (a) 5 (b) 10 (c) 15 (d) 20
- ix. Which of the following oscillator cannot be used in low frequency oscillations? **1**
 (a) Wein bridge oscillators (b) RC phase shift oscillators
 (c) Colpitts oscillators (d) RC oscillators
- x. What happens to the non-linear distortion due to the initiation of the negative feedback? **1**
 (a) Level of non- linear distortion increases
 (b) Level of non- linear distortion decreases
 (c) Level of non- linear distortion remains stable
 (d) Level of non-linear distortion changes sinusoidal
- Q.2 i. What is diffusion current? **2**
 ii. What do you mean by space charge region? **3**
 iii. Draw and explain the V-I characteristics of tunnel diode? **5**
- OR iv. Draw the circuit diagram of a full wave rectifier using two diodes and calculate: **5**
 (a) I_{dc} (b) I_{rms}
 (c) PIV rating of diode
- Q.3 i. Why CE configuration is most popular in amplifier circuits? **2**
 ii. The value of β for a transistor is 100. If the value of emitter current is 10mA, then determine the values of collector and base current. **3**
 iii. Draw and explain the input and output characteristics of a transistor in CB configuration. **5**

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- OR iv. Explain: (any two): **5**
 (a) Base spreading resistance
 (b) Transistor as an amplifier
 (c) Need of biasing for a transistor
- Q.4 i. What is the significant difference between the construction of an enhancement type MOSFET and a depletion type MOSFET? **2**
 ii. How is an FET used as a voltage variable resistor? Explain. **3**
 iii. Draw the drain characteristics of JFET. Explain different operating regions in the characteristics with proper reasoning. **5**
- OR iv. Define (or write) the following: **5**
 (a) Shockley's equation (b) D.C. drain resistance
 (c) A.C. drain resistance (d) Transconductance
 (e) Amplification factor
- Q.5 Attempt any two:
 i. With the help of a suitable circuit diagram, explain the working of a RC coupled amplifier. Derive the expression for voltage gain of the amplifier. **5**
 ii. Explain the following: **5**
 (a) Transconductance amplifier
 (b) Darlington amplifier
 iii. Derive the equation for conversion efficiency of class-B power amplifier. **5**
- Q.6 Attempt any two:
 i. Enumerate any five effects of negative feedback on the various characteristics of the amplifier. **5**
 ii. Give the two Barkhausen condition required for sinusoidal oscillations to be sustained. **5**
 iii. Explain the operation of a transistorized Wien-Bridge oscillator with the help of neat circuit diagram. How is amplitude stability achieved in this circuit? **5**

Scheme of Marking

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Note: The Paper Setter should provide the answer wise splitting of the marks in the scheme below.

Q.1	i	Which of the factors doesn't change the diode current. d. Resistance	1
	ii	Efficiency of a centre tapped full wave rectifier is _____ a) 81.2%	1
	iii	Comparing fixed and collector to base bias which of the following statement is true? b. Collector to base bias is more stable	1
	iv	When the collector junction is reverse biased and emitter junction is forward biased, the operating region of the transistor is called _____ b. active region	1
	v	The constant current region of a JFET lies between _____ b) Pinch off and breakdown	1
	vi	A JFET is a driven device. c) Voltage	1
	vii	Why is Darlington configuration not suitable for more than two transistors? a. Because leakage current increases and voltage gain decreases with multiple numbers of transistors	1

viii	If output of transistor amplifier is 5 V and input of that amplifier is 250 mV then voltage gain will be d) 20	1
ix	Which of the following oscillator cannot be used in low frequency oscillations? c. Colpitts oscillators	1
x	What happens to the non-linear distortion due to the initiation of the negative feedback? b. level of non- linear distortion decreases	1
Q.2	i. What is diffusion current? Defination: 2 marks	2
	ii. What do you mean by space charge region? Explanation:3 marks	3
	iii. Draw and explain the V-I Characteristics of Tunnel Diode? Diagram: 2 marks Explanation:3 marks	5
OR	iv. Draw the circuit diagram of a full wave rectifier using two diodes and calculate (i) I_{dc} (ii) I_{rms} (iii) PIV rating of diode Circuit Diagram: 1 mark (i) I_{dc} 1.5 marks (ii) I_{rms} 1.5 marks (iii) PIV rating of diode 1 mark	5
Q.3	i. Why CE configuration is most popular in amplifier circuits? Explanation:2 marks	2
	ii. The value of β for a transistor is 100. If the value of emitter current is 10mA, then determine the values of collector and base current. Solution:	3

		$\beta = \alpha / 1 - \alpha$ $\alpha = \beta / \beta + 1$ $\alpha = 0.98$ $I_E = 9.8 \text{ mA}$ $I_B = 0.2 \text{ mA}$	1 mark 1 mark 1 mark	
	iii.	Draw and explain the input and output characteristics of a transistor in CB configuration? Input Char: Diagram: 1 mark Explanation: 1 marks Output Char: Diagram: 1 marks Explanation: 2 marks		5
OR	iv.	Explain: (any two) (i) Base Spreading Resistance (ii) Transistor as an Amplifier (iii) Need of Biasing for a transistor		5
		2.5 marks for Each		
Q.4	i.	What is the significant difference between the construction of an enhancement type MOSFET and a depletion type MOSFET? Explanation: 2 marks		2
	ii.	How is an FET used as a voltage variable resistor? Explain. Explanation: 3 marks		3
	iii.	Draw the drain characteristics of JFET. Explain different operating regions in the characteristics with proper reasoning. Char Diagram: 2 marks Explanation: 3 marks		5
OR	iv.	Define (or write) the following: (i) Shockley's Equation (ii) D.C. Drain Resistance (iii) A.C. Drain Resistance (iv) Transconductance (v) Amplification Factor		5

		1 marks for Each		
		Attempt any two:		
Q.5	i.	With the help of a suitable circuit diagram, explain the working of a RC coupled amplifier. Derive the expression for voltage gain of the amplifier. Diagram: 1 marks Explanation: 2 Marks Derivation: 2 marks		5
	ii.	Explain the following: (i) Transconductance amplifier (ii) Darlington amplifier		5
		2.5 marks for Each		
OR	iii.	Derive the equation for conversion efficiency of class-B power amplifier. Derivation: 5 marks		5
Q.6		Attempt any two:		
	i.	Enumerate any 5 effects of negative feedback on the various characteristics of the amplifier. 1 mark for each		5
	ii.	Give the two Barkhausen condition required for sinusoidal oscillations to be sustained. 2.5 marks for each condition		5
	iii.	Explain the operation of a transistorized Wien-Bridge oscillator with the help of neat circuit diagram. How is amplitude stability achieved in this circuit? Diagram: 1 mark Explanation: 2 marks Derivation: 2 marks <i>or with Expression of amplitude.</i>		5
