

Enrollment No.....



Faculty of Engineering
End Sem Examination Dec 2024
EE3CO57 Analog & Digital Circuits

Programme: B.Tech.

Branch/Specialisation: EE

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. Assume suitable data if necessary. Notations and symbols have their usual meaning.

		Marks	BL	PO	CO	PSO
Q.1	i. The battery connection required to forward bias a p-n junction is:	1	01	01	01	01
	(a) +ve terminal to p and -ve terminal to n					
	(b) -ve terminal to p and +ve terminal to n					
	(c) -ve terminal to p and -ve terminal to n					
	(d) None of these					
	ii. The optical signals are detected by:	1	01	01	01	01
	(a) Photo diode (b) Zener diode					
	(c) PIN diode (d) GUNN diode					
	iii. If an emitter current is changed by 4mA, the collector current changes by 3.5mA. the value of β will be:	1	03	01 02	03	02
	(a) 7 (b) 0.875 (c) 0.5 (d) 3.5					
	iv. The frequency response of RC coupling is:	1	01	01	01	01
	(a) Good (b) Very good					
	(c) Excellent (d) Poor					
	v. Which of the following statement is correct for JFET?	1	02	01	02	01
	(a) The JFET is mostly referred to as a depletion mode device					
	(b) The JFET is usually ON when there is no potential difference between the gate and source terminal					
	(c) The JFET has small input impedance					
	(d) None of these					

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vi.	Which one of the following is not a basic MOSFET device type? (a) Enhancement P-channel MOSFET (b) Depletion N-channel MOSFET (c) Narrow P-channel MOSFET (d) Enhancement N-channel MOSFET	1	02	01	02	01
vii.	A full adder adds: (a) 2 bits (b) 3 bits (c) 4 bits (d) 5 bits	1	3	$\frac{1}{2}$	3	2
viii.	Digital circuit can be made by the repeated use of: (a) OR gates (b) NOT gates (c) NAND gates (d) None of these	1	03	$\frac{01}{02}$	03	02
ix.	The flip-flop is used to store the: (a) Decimal data (b) Hexadecimal data (c) Both (a) and (b) (d) Binary data	1	02	01	02	01
x.	A shift register using flip-flop is called: (a) Universal shift register (b) Dynamic shift register (c) Static shift register (d) Flip-flop shift register	1	02	$\frac{1}{2}$	02	01
Q.2	i. Explain the formation of depletion region in a PN Junction diode. ii. Explain the functioning of a PN diode in both forward and reverse bias regions. iii. Derive an expression for I_{dc} and I_{rms} half wave rectifier circuit and find its maximum efficiency.	2 3 5	02 02 03	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{01}{02}$	02 02 03	01 01 02
OR	iv. Explain the operation of tunnel diode with suitable V-I characteristics and energy band diagrams.	5	02	$\frac{1}{2}$	02	01
Q.3	i. What do you understand by thermal runaway and stability? ii. Explain RC coupled amplifier with diagram also mention its application.	2 8	02 02	$\frac{1}{2}$ $\frac{1}{2}$	02 02	01 01

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OR	iii. What are the different regions in which a transistor can work? Explain the criteria under which a transistor works as an amplifier and an oscillator.	8	01	01	01	01
Q.4	i. State De Morgan Laws. Explain NAND and NOR DTL gates. ii. Why is a FET called voltage-controlled device? What are the advantages of MOSFET compared to a normal FET?	3 7	03 02	$\frac{01}{02}$ $\frac{1}{2}$	03 02	02 01
OR	iii. Explain the working and construction of MOSFET also draws its characteristics.	7	02	$\frac{1}{2}$	02	01
Q.5	i. State basic theorems and properties of Boolean Algebra. ii. What is full adder? Implement full adder using two half adders.	4 6	02 02	$\frac{1}{2}$ $\frac{1}{2}$	02 02	01 01
OR	iii. Design 16:1 multiplexer using 8:1 multiplexer.	6	03	$\frac{01}{02}$	03	02
Q.6	Attempt any two: i. State the difference between flip-flop and latch. ii. Differentiate between random-access memory and read-only memory. iii. Differentiate between ripple counters and synchronous counters.	5 5 5	01 01 01	01 01 01	01 01 01	01 01 01

Marking Scheme
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Q.1	i)	(a) +ve terminal to p and -ve terminal to n		1
	ii)	(a) photo diode		1
	iii)	(a) 7		1
	iv)	(d) poor		1
	v)	(b) the JFET is usually ON when there is no potential difference between the gate and source terminal.		1
	vi)	(c) Narrow P-channel MOSFET		1
	vii)	(b) 3 bits		1
	viii)	(c) NAND gates		1
	ix)	(d) binary data		1
	x)	(c) Static shift register		1
Q.2	i.	Explain the formation of depletion region in a PN Junction diode.		2
	ii.	PN diode in forward bias	1.5 marks	3
		PN diode in reverse bias	1.5 marks	
	iii.	Derive an expression for I_{dc} and I_{rms} half wave rectifier circuit find its maximum efficiency.	2.5 2.5	5
OR	iv.	Explain the operation of tunnel diode with suitable V-I characteristics energy band diagrams.	2.5 marks 2.5 marks	5
Q.3	i.	thermal runaway	1 mark	2
		thermal stability	1 mark	
	ii.	Explain RC coupled amplifier	3 marks	8
		Diagram	2 marks	
		Application	3 marks	
OR	iii.	different regions	4 marks	8

Explain the criteria under which a transistor works as an amplifier and an oscillator.
4 marks

Q.4	i.	State De Morgan Laws.	1 mark	3
		Explain NAND and NOR DTL gates.	2 marks on each	
	ii.	Why is a FET called voltage-controlled device	3 marks	7
		advantages of MOSFET compared to a normal FET?	4 marks	
OR	iii.	Working	3 marks	7
		construction of MOSFET	2 marks	
		draws its characteristics.	2 marks	
Q.5	i.	Theorems	2 marks	4
		properties of Boolean Algebra.	2 marks	
	ii.	What is full adder	3 marks	6
		implement full adder using two half adders.	3 marks	
OR	iii.	Design 16:1 multiplexer using 8:1 multiplexer.		6
		(1 marks on each step)		
Q.6				
	i.	difference between flip-flop and latch		5
		(1 marks on each step)		
	ii.	random-access memory and read-only memory.		5
		(1 marks on each step)		
	iii.	Differentiate between ripple counters and synchronous counters.		5
		(1 mark on each step)		
