

Total No. of Questions: 6

Total No. of Printed Pages: 2



**Enrollment No.....**  
**Faculty of Engineering**  
**End Sem Examination May-2024**  
**EN3ES12 / EN3ES23 Principles of Electronics**  
Programme: B.Tech.                      Branch/Specialisation: CSBS

**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.

- Q.1 i. For insulators, the forbidden gap is of the order of- **1**  
(a) 5 eV      (b) 1 eV      (c) 0.1 eV      (d) zero
- ii. n-type silicon is obtained by doping silicon with- **1**  
(a) Germanium      (b) Aluminum  
(c) Boron      (d) Phosphorus
- iii. For a germanium P-N junction, the maximum value of barrier potential is- **1**  
(a) 0.3 V      (b) 0.7 V      (c) 1.3 V      (d) 1.7 V
- iv. In forward bias, the width of potential barrier in a p-n junction diode- **1**  
(a) Increases      (b) Decreases  
(c) Remain constant      (d) First increase then decrease
- v. Find collector current, if base current is 0.03 mA and  $\beta=100$ : **1**  
(a) 0.3 mA      (b) 3 mA      (c) 0.3  $\mu$ A      (d) 0.03  $\mu$ A
- vi. The number of depletion layer in BJT is- **1**  
(a) 3      (b) 4      (c) 2      (d) 1
- vii. For an n-channel FET, what is the direction of current flow? **1**  
(a) Drain to source      (b) Source to drain  
(c) Gate to source      (d) Gate to drain
- viii. The input control parameter of a JFET is- **1**  
(a) Gate current      (b) Drain voltage  
(c) Source voltage      (d) Gate voltage
- ix. Positive feedback is used in- **1**  
(a) High gain amplifier      (b) Low gain amplifier  
(c) Oscillators      (d) Rectifier

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- x. If A and B are the inputs of a half adder, the carry is given by- **1**  
(a) A AND B      (b) A OR B      (c) A XOR B      (d) A EX-NOR B
- Q.2 i. What is fermi level? **2**  
ii. Explain drift and diffusion phenomenon. **3**  
iii. Discuss different type of semiconductor materials with the help of energy band diagram. **5**
- OR iv. Explain intrinsic and extrinsic semiconductor. **5**
- Q.3 i. What is varactor diode? **2**  
ii. Explain the working of p-n diode in forward and reverse bias conditions. **8**
- OR iii. Draw the circuit diagram of full wave rectifier and explain the operation and also draw the input and output waveforms. **8**
- Q.4 i. Define  $\alpha$  and  $\beta$  of a transistor and derive the relationship between them. **3**  
ii. Explain the input and output characteristics of transistors in common base configuration. **7**
- OR iii. Draw NPN and PNP transistors. Label all the currents and show the direction of flow. How are all the currents of a transistor related? **7**
- Q.5 i. Define pinch-off voltage for a JFET. **2**  
ii. Draw the structure of an N-channel depletion type MOSFET. Explain its working with the help of output drain characteristics and transfer characteristics. **8**
- OR iii. What is the difference between depletion and enhancement type MOSFET in terms of construction, operation and characteristics? **8**
- Q.6 Attempt any two: **5**  
i. Explain the properties of negative feedback. **5**  
ii. Draw the circuit of a subtractor using op-amp and explain its working. **5**  
iii. Draw the schematic of a full adder with the help of truth table. Explain how a full adder works. Give the expression for sum and carry in full adder. **5**

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# Marking Scheme

## EN3ES23 (T) Principles of Electronics (T)

Q.1	i)	A	1
	ii)	D	1
	iii)	A	1
	iv)	B	1
	v)	B	1
	vi)	C	1
	vii)	A	1
	viii)	D	1
	ix)	C	1
	x)	A	1
Q.2	i.	What is fermi level?	2
	ii.	Explain drift and diffusion phenomenon.	3
	iii.	Discuss different type of semiconductor materials with the help of energy band diagram. (Insulator, conductor, semiconductor describe with band diagram equal marks for each)	5
OR	iv.	Explain intrinsic and extrinsic semiconductor. Intrinsic-2.5 Marks Extrinsic- 2.5 marks	5
Q.3	i.	What is varactor diode?	2
	ii.	Explain the working of p-n diode in forward and reverse bias conditions. Diagram-2 Marks Forward bias- 3 Marks Reverse bias- 3 Marks	8
OR	iii.	Draw the circuit diagram of full wave rectifier and explain the operation and also draw the input and output waveforms. Circuit diagram- 2 Marks Explanation- 4 Marks Waveforms- 2 Marks	8
Q.4	i.	Define $\alpha$ and $\beta$ of a transistor and derive the relationship between them.	3
	ii.	Explain the input and output characteristics of transistors in common base configuration.	7

OR	iii.	Diagram- 1 Mark Explanation- 4 Marks Graph- 2 Marks	7
		Draw NPN and PNP transistors. Label all the currents and show the direction of flow. How are all the currents of a transistor related?	
		Diagram- 3 Marks	
		Current relation- 4 Marks	
Q.5	i.	Define pinch-off voltage for a JFET.	2
	ii.	Draw the structure of an N-channel depletion type MOSFET. Explain its working with the help of output drain characteristics and transfer characteristics. Diagram- 2 Marks Working- 4 Marks Characteristics- 2 Marks	8
OR	iii.	What is the difference between depletion and enhancement type MOSFET in terms of construction, operation and characteristics. Construction- 3 Marks Operation- 3 Marks Characteristics- 2 Marks	8
Q.6	i.	Explain the properties of negative feedback. 5 property- 5 Marks	5
	ii.	Draw the circuit of a subtractor using op-amp and explain its working. Diagram- 1 Marks Explanation- 4 Marks	5
	iii.	Draw the schematic of a full adder with the help of truth table. Explain how a full adder works. Give the expression for sum and carry in full adder. Diagram- 1 mark Explanation- 2 marks, expression- 2 marks	5

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