**FRANCIS XAVIER ENGINEERING COLLEGE, TIRUNELVELI**

**(An Autonomous Institution)**

**DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING**

**ACADEMIC YEAR: 2024-25/EVEN BATCH: 2024-28 SEM: 02**

**Course Code / Name: 24EE2501 / Fundamental of Electrical and Electronics Engineering**

**QUESTION BANK**

**Unit III – SEMICONDUCTOR DEVICES AND APPLICATIONS**

Characteristics of PN Junction Diode and Zener Diode– Half wave and Full wave Rectifier –Bipolar Junction Transistor: CB, CE, CC Configurations and Characteristics.

**Course Outcome – CO3:** Construct the Characteristics utilization of semiconductor devices.

**Important topics**

* Topic 1 – T1- Characteristics of PN Junction Diode and Zener Diode
* Topic 2 – T2- Half wave and Full wave Rectifier & Application
* Topic 3 – T3- Bipolar Junction Transistor: Common Base, Common Emitter,
* Topic 4 – T4-Common Collector Characteristics, Applications.

**PART – A**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Q.No** | **Question** | **Max.**  **Marks** | **Topic** | **CO** | **BL** | **KC** | **PI** |
| 1. | Demonstrate the distinct mechanisms by which PN junction diodes experience breakdown under reverse bias conditions. | 2 | T1 | 3 | K3 | F | 2.2.3 |
| 2. | Mention the type of semiconductor device, which is formed by joining a P-type region and an N-type region together? | 2 | T1 | 3 | K2 | C | 1.3.1 |
| 3. | Comment on the output of the circuit given below. | 2 | T2 | 3 | K4 | C | 3.1.6 |
| 4. | Compare the performance of a transistor on three different configurations. | 2 | T3 | 3 | K3 | F | 1.3.2 |
| 5. | Write the current amplification factor for a CE transistor. | 2 | T3 | 3 | K3 | C | 1.3.1 |
| 6. | Draw the input and output characteristics of CC Bipolar Junction transistor. | 2 | T4 | 3 | K2 | P | 2.2.3 |

**PART – B**

| **Q.No** | | **Question** | **Max. Marks** | **Topic** | **CO** | **BL** | **KC** | **PI** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1. | **(i)** | Discuss in detail the behaviour of a PN junction diode change when subjected to different types of electrical biasing? | 9 | T1 | 3 | K2 | C | 3.1.6 |
|  | **(ii)** | A person is designing a circuit to protect sensitive electronics from overvoltage spikes. The maximum voltage the circuit can handle is 20V. He decided to use a zener diode as a voltage clamp. Determine the appropriate Zener voltage and resistor values needed to clamp the voltage at 20V. | 4 | T1 | 3 | K2 | P | 3.1.6 |
| 2. |  | Illustrate in detail about a Zener diode along with its voltage-current relationship, which could be used in a voltage regulation circuit to ensure a stable output voltage despite fluctuations in the input voltage? | 13 | T2 | 3 | K3 | C | 1.3.1 |
| 3. | **(i)** | You are tasked with upgrading an old power supply unit in a piece of equipment. The existing power supply uses a half-wave rectifier, but you're considering whether it's worth upgrading to a full-wave rectifier for improved performance. Discuss the advantages and disadvantages of upgrading to a full-wave rectifier in terms of output voltage, ripple, and efficiency. | 8 | T2 | 3 | K3 | C | 3.1.6 |
|  | **(ii)** | Discuss the operation of half-wave rectifier with the help of necessary waveforms | 5 | T2 | 3 | K2 | C | 3.1.6 |
| 4. |  | Give the circuit arrangement for obtaining the input and output characteristics of a transistor in Common Emitter configuration which finds its application in an amplifier circuit. Elaborate in detail. | 13 | T3 | 3 | K4 | F | 3.2.2 |
| 5. |  | With neat sketch explain the input and output characteristics of a transistor in CB configuration, which is used, for amplifiers that requires low input impedance such as microphones. Draw also the necessary circuit. | 13 | T4 | 3 | K3 | P | 3.1.6 |

**PART – C**

| **Q.No** | | **Question** | **Max. Marks** | **Topic** | **CO** | **BL** | **KC** | **PI** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 |  | Using the two-diode analogy explain why the base emitter junction has to be forward biased to provide collector current. (ii) Sketch a common emitter amplifier circuit with an NPN transistor. | 15 | T3 | 2 | K3 | C | 3.2.2 |

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| **Topic** | **Part A** | | **Part B** | | **Part C** | |
| **No. of Questions** | **Total Marks** | **No. of Questions** | **Total Marks** | **No. of Questions** | **Total Marks** |
| Topic 1 Characteristics of PN Junction Diode and Zener Diode | 2 | 4 | 1 | 13 |  |  |
| Topic 2 – Half wave and Full wave Rectifier & Application | 1 | 2 | 2 | 26 |  |  |
| Topic 3 Bipolar Junction Transistor: Common Base, Common Emitter | 2 | 4 | 1 | 13 | 1 | 15 |
| Topic 4 – Common Collector Characteristics, Applications. | 1 | 2 | 1 | 13 |  |  |
| **TOTAL** | **6** | **12** | **5** | **65** | **1** | **15** |