# Bihar Engineering University, Patna

## B.Tech 1st Semester Examination, 2024

***Course: B.Tech***
***Code: 100114***

***Subject: Basic Electronics Engineering***

***Time: 03 Hours***
***Full Marks: 70***

***Instructions:-***

*(i) The marks are indicated in the right-hand margin.*
*(ii) There are NINE questions in this paper.*
*(iii) Attempt FIVE questions in all.*
*(iv) Question No. 1 is compulsory.*

***Q.1*** ***Choose the correct answer from the following (Any seven questions only):-*** [2 x 7 = 14]

(a) Which of these is used for amplification?
(i) BJT in cutoff (ii) BJT in active mode
(iii) BJT in saturation (iv) BJT in reverse active mode

(b) Which terminal in JFET controls the current?
(i) Gate (ii) Drain
(iii) Source (iv) Substrate

(c) BJT used as a switch operates in:
(i) Active region (ii) Cutoff and Saturation
(iii) Reverse active (iv) Linear region

(d) What is the built-in potential typically across a silicon p-n junction?
(i) 0.3 V (ii) 1.1 V
(iii) 0.7 V (iv) 2.0 V

(e) What is the peak inverse voltage for a center-tap full-wave rectifier?
(i) $V_m$ (ii) $2V_m$
(iii) $V_m/2$ (iv) $\sqrt{2}\,V_m$

(f) Zener diode is mostly used in:
(i) Amplification (ii) Voltage regulation
(iii) Rectification (iv) Oscillation

(g) In MOSFET, the gate terminal is:
(i) Conductive (ii) Insulated from the channel
(iii) Directly connected to the source (iv) Connected to the drain

(h) The voltage gain of a voltage follower (buffer amplifier) is:
(i) Zero (ii) Unity
(iii) Infinity (iv) Negative

(i) In 2's complement method, what is the 2's complement of binary number 0101?
(i) 1011 (ii) 1101
(iii) 1111 (iv) 1010

(j) Which of the following is a universal gate?
(i) AND (ii) NAND
(iii) OR (iv) NOT

***Q.2*** (a) Explain the construction and working of an Enhancement Type MOSFET and draw its characteristics. [7]

(b) Define operating point. Explain the concept of load line analysis with suitable diagrams. [7]

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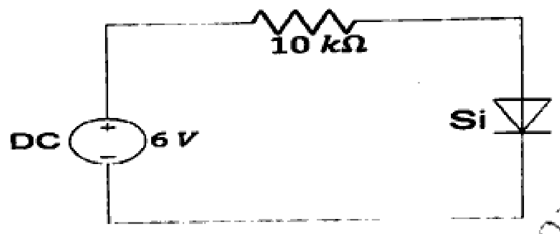
| **Q.3** | (a) | With a neat diagram, explain the working of a Zener diode as a voltage regulator and draw its V-I characteristics. | [7] |
| | (b) | Describe the three configurations of BJT (CE, CB, CC) and their applications. | [7] |
| **Q.4** | (a) | Derive the Shockley equation for JFET and explain the parameters involved. | [7] |
| | (b) | Explain the difference between intrinsic and extrinsic semiconductors with suitable energy band diagrams. | [7] |
| **Q.5** | (a) | Discuss the role of filter circuits in rectifier applications. Explain the capacitor filter with waveforms. | [7] |
| | (b) | Determine the value of the current through the diode circuit given below. Assume $V_\gamma = 0.7\,V$. | [7] |

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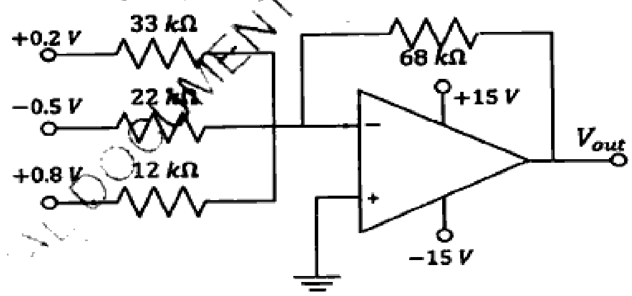
| **Q.6** | (a) | Convert $(0.513)_{10}$ to octal. | [7] |
| | (b) | Explain how an Op-Amp integrator works and derive the output expression. | [7] |
| **Q.7** | (a) | Discuss the mechanism of breakdown in a diode. Differentiate between Zener and Avalanche breakdown. | [7] |
| | (b) | Find the output of the Op-amp. Assume Op-amp is ideal. | [7] |

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| **Q.8** | (a) | Explain the working of a Half Wave Rectifier and derive the expressions for average and RMS values of output voltage. | [7] |
| | (b) | Implement an XOR gate using NAND gates. | [7] |

**Q.9** Write short notes on ***any two*** of the following: **[7 x 2 = 14]**

(a) Virtual ground in Op-Amp circuits.
(b) Describe the concept of thermal runaway in BJT.
(c) VI characteristics of LED
(d) Half- Adder