

Code No: 182AG

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech I Year II Semester Examinations, September - 2023

ELECTRONIC DEVICES AND CIRCUITS

(Common to ECE, EIE, CSE (AI&ML), CSE (IOT), AI&DS, AI&ML)

Time: 3 Hours

Max. Marks: 60

Note: This question paper contains two parts A and B.i) **Part - A** for 10 marks, ii) **Part - B** for 50 marks.

- Part-A is a compulsory question which consists of ten sub-questions from all units carrying equal marks.
- Part-B consists of **ten questions** (numbered from 2 to 11) **carrying 10 marks each**. From each unit, there are two questions and the student should answer one of them. Hence, the student should answer five questions from Part-B.

PART - A**(10 Marks)**

- 1.a) What is diffusion length (L)? [1]
- b) Define Cut-in voltage. Give the cut-in voltage of Si and Ge diodes. [1]
- c) Classify clipper circuits based on the connection of the active device. Mention their uses. [1]
- d) State Clamping Circuit Theorem. [1]
- e) Show that $(1/\alpha) - (1/\beta) = 1$. [1]
- f) Mention different modes of operation of BJT. [1]
- g) Define pinch off voltage? [1]
- h) List the classification of FETs. [1]
- i) Draw the symbols of Schottky Diode and Photo diode. [1]
- j) List the applications of SCR. [1]

PART - B**(50 Marks)**

- 2.a) Explain the temperature dependence of VI characteristics of PN junction diode.
- b) Explain break down mechanisms in semiconductor diodes. [5+5]

OR

- 3.a) In a typical n-type semiconductor, the Fermi level lies 0.5 eV below the conduction band at 300K. Find its new position when temperature is increased to 600K.
- b) A Diode operating at 300 K at a forward voltage of 0.4V carries a current of 10 mA when voltage is changed to 0.42 V the current becomes thrice. Calculate the value of reverse leakage current and η for the diode (Assume $V_T = 26$ mV). [4+6]
- 4.a) Explain half-wave rectifier and derive its ripple factor expression.
- b) An AC supply of 230 V is applied to a half-wave rectifier circuit through transformer of turns ratio 5:1. Assume the diode is an ideal one. The load resistance is 300 Ω . Find:
 - i) DC output voltage
 - ii) PIV
 - iii) Maximum and average values of power delivered to the load. [5+5]

OR

- 5.a) Give the circuit of different types of shunt clippers and explain their operation with the help of their transfer characteristics.
- b) Explain the principle of clamping and discuss the effect of source impedance, shunt resistance and cut in voltage. [5+5]
- 6.a) Compare the typical characteristics of CE, CB and CC configuration.
- b) Calculate the values of I_E , β_{dc} and α_{dc} for a transistor with $I_C=12.427\mu A$, $I_B=200\mu A$, $I_{CBO}=7\mu A$. Also determine the new level of I_C which will result from reducing I_B to $150\mu A$. [5+5]

OR

- 7.a) Explain the working of NPN and PNP transistor.
- b) With necessary circuit and waveform, explain the switching characteristics of a transistor in detail. [5+5]
- 8.a) Explain the working of a P channel JFET and draw the VI characteristics of it.
- b) Explain with the help of neat diagrams, the structure of an N-channel MOSFET and its Volt-ampere characteristics. In what ways it is different from a bipolar transistor. [5+5]

OR

- 9.a) Explain the performance of FET as a voltage variable resistor.
- b) Define and explain the three parameters of a JFET give the relation between them.[5+5]
- 10.a) Design and draw a Zener regulator circuit to meet the following specifications Load voltage= 8 V, Input Voltage =30V, Load Current = 0-50mA, $I_{zmin} = 5mA$, $P_z = 1Watts$.
- b) Explain Varactor Diode with its characteristics and list the applications. [5+5]

OR

- 11.a) With neat energy band diagrams, explain the operation and characteristics of Tunnel Diode.
- b) A Zener voltage Regulator circuit is to maintain constant voltage at 60 V, over a current range from 5 to 50 mA. The input supply voltage is 200V. Determine the value of resistance R to be connected in the circuit for voltage regulation from load current $I_L = 0$ mA to I_{Lmax} , the maximum possible value of I_L . What is the value of I_{Lmax} ? [5+5]

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