

**R22**

**Code No: 182AG**

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**B. Tech I Year II Semester Examinations, February - 2025**

**ELECTRONIC DEVICES AND CIRCUITS**

**(Common to ECE, CSE, IT, CSIT, CE(SE), CSE(CS), CSE(AI&ML), CSE(DS), CSE(IOT), AI&DS, AI&ML, CSD)**

**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) Define dynamic resistance of diode. [1]
- b) What is cut-in voltage of diode? [1]
- c) Define regulation. [1]
- d) State clamping theorem. [1]
- e) What is the relation between  $\alpha$  and  $\beta$  of transistor? [1]
- f) Name different switching times. [1]
- g) What are the carriers in N-channel JFET? [1]
- h) Draw depletion type MOSFET structure. [1]
- i) What is principle of photo diode? [1]
- j) Draw the diagram of SCR. [1]

**PART - B**

**(50 Marks)**

- 2.a) Derive diode current equation.
- b) A silicon diode has a saturation current of  $7.5 \mu\text{A}$  at room temperature 300 K. Calculate the saturation current at 400 K. [7+3]

**OR**

- 3.a) With a neat diagram, explain the energy band diagram of PN junction diode.
- b) Sketch V-I characteristics of a PN diode for the following conditions:
  - i)  $R_f = 0, V_\gamma = 0, R_r = \infty$
  - ii)  $R_f = 0, V_\gamma = 0.6\text{V}, R_r = \infty$
  - iii)  $R_f = \text{Non-zero, fixed value}, V_\gamma = 0, R_r = \infty$

Where  $V_\gamma$  is the cut-in voltage,  $R_f$  is the forward dynamic resistance &  $R_r$  is the reverse dynamic resistance of the diode. [4+6]

- 4.a) Explain construction and operation of a bridge rectifier.
- b) Derive ripple factor for half wave rectifier. [5+5]

**OR**

- QA QA QA QA QA QA QA QA QA
- 5.a) Discuss full wave rectifier with L-section filter.  
b) Design a filter for full wave rectifier circuit with LC filter to provide an output voltage of 10 V with a load of 200 mA and the ripple is limited to 2. [5+5]

- QA QA QA QA QA QA QA QA QA
- 6.a) With a neat diagram explain the various current components in an NPN bipolar junction transistor.  
b) What is Early-effect? Explain why it is called as base-width modulation. [5+5]

**OR**

- 7.a) With neat sketches describe CE configuration static input-output characteristics and indicate the cut-off, saturation and active regions on the output characteristics.  
b) Calculate the values of  $I_C$  and  $I_E$  for a transistor with  $\alpha_{dc} = 0.99$  and  $I_{CBO} = 5\mu A$ , if  $I_B$  is measured as  $20\mu A$ . [6+4]

- QA QA QA QA QA QA QA QA QA
- 8.a) Explain how FET works as voltage variable resistor.  
b) Explain the JFET Small signal Model. [5+5]

**OR**

- 9.a) Explain the construction and operation of a P-channel MOSFET in depletion mode.  
b) Draw and explain small-signal model of a MOSFET. [5+5]

- QA QA QA QA QA QA QA QA QA
- 10.a) With the help of V-I characteristics, explain SCR operation.  
b) Explain the Voltage regulation using Zener Diode. [5+5]

**OR**

- 11.a) With neat energy band diagrams, explain the V-I characteristics of Tunnel diode.  
b) With neat sketches, explain the operation of Schottky Barrier Diode. [6+4]

QA QA QA QA QA QA QA QA QA

---ooOoo---

QA QA QA QA QA QA QA QA QA

QA QA QA QA QA QA QA QA QA

QA QA QA QA QA QA QA QA QA