Printed Pages:02 **Sub Code: NEC 014**

Paper Id: | 1 | 3 | 1 | 6 | 2 | 9 | **Roll No.** | | | | | | | | | | |

B.TECH

(SEM-VI) THEORY EXAMINATION 2017-18

ADVANCE SEMICONDUCTOR DEVICES

Time: 3 Hours ***Total Marks: 100***

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.
2. Any special paper specific instruction.

SECTION A

1. Attempt *all* questions in brief. 2 x 10 = 20

a. What is a crystal?
b. Why space region called the depletion region?
c. Enumerate the special features of MESFETs.
d. What is the pinch-off voltage in a JFET?
e. What do you mean by tunneling?
f. Write the differences between Transistor and Thyristor.
g. What does LASER stand?
h. List the advantages of Laser devices.
i. What is the photodiode? Define.
j. How CCD is made? Explain.

SECTION B

2. Attempt any *three* of the following: 10 x 3 = 30

a. Explain why the energy levels of an atom become energy in a solid. Define a hole in a semiconductor. Explain why a semiconductor acts as an insulator at 0K and why its conductivity increases with increasing the temperature.
b. (i)What do you understand by "pinch off" voltage and cut-off voltage as applied to FET?
(ii) How is an FET used as a voltage variable resistor? Explain.
c. Write a short note on:
(i) BARITT Diode.
(ii) TUNNETT Diode.
d. What is LED? Give its principle of working, construction, circuit symbol, merits-demerits and applications.
e. With a suitable diagram describe the working principle of a photodiode. Explain how the various quadrants of its V-I characteristics are used in different applications.

SECTION C

3. Attempt any *one* part of the following: 10 x 1 = 10

(a) (i)Define diffusion coefficient and mobility of a carrier. Derive an expression for electron mobility in terms of diffusion coefficient of electron.
(ii) Write a short note on: Hetro-junction.
(b) Explain the P-n junction operation in forward and reverse biased condition. Also compare the V-I characteristics of P-N junction.

4. Attempt any *one* part of the following: 10 x 1 = 10

(a) Compare the following:
   (i) JFET and MOSFET.
   (ii) MESFET and MODFET.

(b) Define and derive the expression for the threshold voltage for MOS transistor. What are the factors which affect it?

5. Attempt any *one* part of the following: 10 x 1 = 10

(a) Describe the principle of IMPATT diode. Also draw and explain its characteristics.

(b) What is tunneling phenomenon? Explain the V-I characteristics of Tunnel diode. Discuss the semiconductor material required for its fabrication. How do they differ from conventional semiconductor?

6. Attempt any *one* part of the following: 10 x 1 = 10

(a) Consider the V-I characteristics curve of a practical p-n junction diode. In which quadrant of this curve does the following operates:
   (i) Photodiode
   (ii) Laser diode

(b) What do you understand by thyristor? Draw and explain the V-I characteristics of a thyristor.

7. Attempt any *one* part of the following: 10 x 1 = 10

(a) Draw and explain the input and output arrangements for charge-coupled device. Also explain the charge transfer efficiency of the device.

(b) Explain the working operation of a basic charge-coupled device. Also explain its different types.