

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.