B.Tech Odd Semester (CBCS) Exam.,
December—2016

ELECTRONICS AND COMMUNICATION ENGINEERING

(3rd Semester)

Course No. : EC-CF–02

(Solid State Devices)

Full Marks : 50
Pass Marks : 15

Time : 2 hours

Note :
1. Answer *any* **five** questions.
2. Begin each answer in a new page.
3. Answer parts of a question at a place.
4. Assume reasonable data wherever required.
5. The figures in the margin indicate full marks for the questions.

1. *(a)* Define degenerate and compensated semiconductor. 3

(b) Explain the variation of Fermi level position in a semiconductor when it is doped with trivalent and pentavalent materials. 7

2. *(a)* What is mass action law? Derive the minority charge concentration in n-type and p-type semiconductor using mass action law. 2+5=7

(b) In a n-type semiconductor the Fermi level lies 0·25eV below the conduction level at a room temperature 300 K. If the temperature is increased to 400 K, determine the new position of Fermi level. 3

3. Derive the calculation of depletion width of p-n junction diode. 10

4. *(a)* With a neat sketch, explain the working of bridge rectifier. 6

(b) Define ripple factor and derive expression for it for the following rectifiers : 4

(i) Half-wave rectifier

(ii) Full-wave rectifier

5. *(a)* What is a photonic device? 1

(b) Define electron-hole pair generation and optical absorption. 3

(c) Explain the working of LED. 6

6. *(a)* Define the following parameters of a transistor : 3

(i) Current amplification factor ( )

(ii) Base emitter amplification factor ( )

(iii) Current amplification factor ( )

(b) Draw the output characteristics of CE configuration transistor and briefly explain all the regions. 7

7. *(a)* Name and define the circuit parameters of the JFET. How are they related to each other? 5

(b) Explain the small signal model of JFET. 5

8. Explain the working principle of MOS devices. Derive the expression for drain current for a short channel MOSFET. 3+7=10

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