[18]   SEAT No._____

SARDAR PATEL UNIVERSITY
M.Sc. (Electronics) First Semester Examination (Under CBCS)
March, 2019
PS01CELE21: Semiconductor Science and Devices

Tuesday, March 19, 2019   Time: 10.00 a.m. to 1.00 p.m.   Total Marks: 70

Q. 1	Give the correct (nearest) answer (statement) to the following Multiple Choice Questions (Statements):	8x1 = [8]

(i) In the E versus k curve of a quantum mechanical particle moving through the periodic potential, the discontinuities occur at $n\pi/a$ which define the boundaries of zones, known as
(a) Active zone
(b) Brillouin zone
(c) Fermi zone
(d) Schrodinger zone

(ii) From the Kronig Penney Model, it can be concluded that when the Binding Energy P = 0 (zero), the energy spectrum is
(a) continuous
(b) a line spectrum
(c) discontinuous
(d) piece wise

(iii) The maximum value of the term dE/dK in the band theory corresponds to the point of Inflexion, indicating the material to be
(a) Metal
(b) Insulator
(c) Semiconductor
(d) all of these

(iv) The position of Fermi level of extrinsic semiconductor becomes same as that of the intrinsic semiconductor in
(a) Low Temperature region
(b) Impurity Depletion Region
(c) High temperature Region
(d) None of these

(v) In an Anisotype heterojunction, conductivity of the two semiconductor materials is
(a) Different
(b) Zero
(c) same
(d) None of these

(vi) When an ideal MIS(p type) diode is biased with a small positive voltage (V>0), the bands bend slightly downward. This is the case of
(a) Accumulation
(b) Depletion
(c) Inversion
(d) None of these

(vii) The luminescence in which the excitation is by bombardment of electrons is
(a) Electroluminescence
(b) Cathodoluminescence
(c) Photoluminescence
(d) None of these

(viii) The following is the blue LED material:
(a) GaN
(b) SiC doped with Al
(c) Both (a) and (b) are correct
(d) GaAs

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Q. 2	Give short answers to the following: (any seven) 1. Write Bloch Theorem. 2. Using the energy wave diagram, differentiate between the movement of electron and hole. 3. Derive the equation of group velocity of electrons. 4. Write the equation of the function of density of states for the top of the valence band. 5. Differentiate between Rectifying and Ohmic Contacts. 7. Mention various oxide charges in a MIS diode. 8. Show the construction of an ac plasma element. 9. Draw the LED Drive circuit.	7x2 = [14]
Q.3 (a)	Explain with necessary diagrams the conclusions of Kronig Panney Model.	[6]
(b)	What is the effective mass of an electron? With neat sketch, explain the concept. OR	[6]
(b)	Differentiate between the between the motion of a quantum mechanical particle when (1) free and (2) moving through a potential barrier.	[6]
Q.4 (a)	At absolute zero temperature, an intrinsic semiconductor behaves as an insulator. Describe using necessary equations.	[6]
(b)	Describe how the Hall effect can be used to distinguish between n and p type semiconductors. OR	[6]
(b)	At Fermi level, the probability of a state being occupied is half. Describe using necessary equations.	[6]
Q.5 (a)	Describe the Metal Insulator Semiconductor(MIS) structure.	[6]
(b)	Describe the process of Photoconduction in Semiconductor. OR	[6]
(b)	With proper sketches describe various Heterojunctions.	[6]
Q.6 (a)	What is an electroluminescent display device? Describe its types.	[6]
(b)	What is an LCD? With proper schematics, explain the working of an LCD. OR	[6]
(b)	Explain the working principle of Semiconductor Laser.	[6]

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