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Name:	A
Roll No.:	As Annual (Victoriality and Explant)
Invigilator's Signature :	
CS/B.Tech (ECE-OLD)	/SEM-3/EC-301/2012-13

# 2012 **SOLID STATE DEVICE**

Time Allotted: 3 Hours Full Marks: 70

The figures in the margin indicate full marks. Candidates are required to give their answers in their own words as far as practicable.

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GROUP - A							
( Multiple Choice Type Questions )							
1.	. Choose the correct alternatives for any $ten$ of the follow $10 \times 10^{-5}$						
	i)	Which type of semiconductor is mostly used for form					
	transistor						
		a)	Si	b)	Ge		
		c)	Inp	d)	GaAs.		
	ii)	Which type of capacitance is prominent in reversed bia					
		a)	diffusion	b)	depletion		
		c)	none of these	d)	both of these.		
iii) Which one of the follo				ving provi	des fastest switching		
		a)	BJT	b)	MOSFET		
		c)	JFET	d)	Diode.		

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- iv) Which time is larger
  - a) forward recovery time
  - b) reverse recovery time
  - c) vary time to time
  - d) both are same.
- v) Which current dominates when a pn junction is forward baised
  - a) drift current
- b) displacement current
- c) diffusion current
- d) none of these.
- vi) Input impedence is highest in which
  - a) BJT

- b) JFET
- c) MOSFET
- d) Diode.
- vii) At '0' K The probability of getting electron with energy  $E=E_{\mathrm{F}}$  is
  - a)  $\frac{1}{2}$

b)  $\frac{1}{4}$ 

c) 0

d) 1.

Where  $E_F$  is the Fermi level energy band.

- viii) If temperature increasing zener break down voltage
  - a) increasing
  - b) decreasing
  - c) independent of temperature
  - d) may increase or decrease.
- ix) Whose mobility is higher
  - a) electron
  - b) hole
  - c) both have the same
  - d) sometime electron some time hole.

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- x) The Varactor Diode is used in which bias
  - a) forward
  - b) reverse
  - c) both of these
  - d) sometime forward sometime reverse
- xi) For an impure semiconductor electron concentration is  $4\cdot5\times10^{12}\,/\,cm^3\quad\&\quad hole\quad concentration\quad 4\times10^7\,/\,cm^3\,,$  then position of Fermi level in equilibrium is
  - a) at intrinsic level
  - b) inside valance band
  - c) close to conduction band
  - d) close to valance band.

#### **GROUP - B**

# (Short Answer Type Questions)

Answer any *three* of the following.

 $3 \times 5 = 15$ 

- 2. State the basic steps of monolithic IC fabrication. What is photolithography and how it is done in IC fabrication.
- 3. Write short notes on solar cell.
- 4. Briefly explain the working principle of IMPATT Diode.
- Explain rectiying contact and ohomic contact in the light of Scottky Diode
- 6. Draw and explain the static characteristics of a JFEET.

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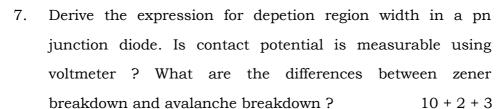
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### **GROUP - C**

# (Long Answer Type Questions)

Answer any *three* of the following.  $3 \times 15 = 45$ 



- 8. Draw and explain the V-I characteristics of a tunnel diode. Point out the negative differential resistance. Which semiconductors are mostly used for forming tunnel diode? What is the main condition for constructing tunnel diode? Mention any two applications of tunnel diode. What do you mean by indirect semi-conductor.
  8 + 2 + 1 + 1 + 2 + 1
- 9. Draw the output characteristics of a CE mode npn transistor. Why npn transistor is more used than pnp transistor. Write out two major applications of transistor. Is  $I_C = \beta I_B$  is true for all three regions, if not then it is true for which region?

10 + 1 + 2 + 2

10. Derive the expression for pinch-off voltage in JFET. Explain how channel is formed and current conduction takes place in an Enhancement MOSFET. Define threhold voltage and flat band voltage of MOSFET 6+6+3

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