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**SRM Institute of Science &Technology**

**Delhi-NCR Campus, Modinagar, Ghaziabad**

**CYCLE TEST – II**

**Course/Branch:** B.Tech Ist Sem/CSE **Session:** FN

**Subject:** Semiconductor Physics and Computational Methods **Subject Code:** 21PYB102J

**Duration:** 1 hour 40mins **Max. Marks:** 50

**Part A (1\*10=10 Marks) Marks BL CO PO**

**Attempt All Questions**

1. Electronic devices involving light 1 1 2 2

A. Optoelectronic devices B. Semicondutor devices

C. Electrical devices D. Optical Device

2.The fermi level in p-type semiconductor lies 1 2 2 1

A. Near the valance band B. Near the conduction band

C. in middle of the energy gap D. None of these

3. A non rectifying electrical junction which gives linear current 1 1 2 1

and voltage curve.

A. Ohmic contact B. Non-ohmic contact

C. Schottky contact D. both B and C

4.An equation that describes the rate at which mass enters 1 1 2 1

a system is equal to the rate at which mass leaves the system

A. Continuity Equation B. Discontinuity equation

C. Poisson’s equation D. Laplace equation

**5.** The electrical conductivity of a pure semiconductor at 0K is 1 1 2 1

A. zero B. one

C. Large D. Finite

6. Conversion of light into electric current is known as 1 2 2 1

A. Photovolatic effect B. Photoemissive cell

C. Radiative effect D. Non-radiative effect

7. Process in which atoms and molecules changes from one state 1 1 2 1

to another state and emits or absorbs radiation is called

A. excitation B. absorption

C. transition D. recombination

8. In stimulated emission, a photon of 1 1 2 1

A. same frequency, phase and polarization and direction of propagation is generated

B. different frequency, phase and polarization and direction of propagation is generated

C. same frequency and differing phase and polarization and direction of propagation is generated

D. same frequency, phase and differing polarization and direction of propagation is generated

9. Bias for easy current flow 1 1 2 1

A. Forward Bias B. No bias

C. P-type bias D. N-type bias

10. A device that converts light energy directly to the 1 2 2 1

electrical energy by the effect of photovoltaic effect

A. Photomultiplier tube B. Lechlanche cell

C. Solar cell D. Muscular cell

**Part B (10\*4=40 Marks) Marks BL CO PO**

**Attempt four Questions.**

**11a.** What is the p-n junction? Explain the operation of a p-n junction diode according to

forward and reverse bias. Draw characteristic lines for forward and reverse bias.?

10 5 2 2

**OR**

**11b.** Explain the metal/ n-type semiconductor junction (when the working function

of the metal is less than the working function of the semiconductor) using the

energy band diagram in the case of thermal equilibrium and potential difference?

**12a.** Explain the basic concept of the photovolatic effect. As an application

of the photovolatic effect, please explain the structure and operation of a solar cell? 10 4 1 2

**OR**

**12b.** What is current of Diffusion and Drift? Using the continuity equation, derive

equations for the Jdrift and the Jdiffusion for the N-type semiconductor.?.

**Q13a.(i)** Explain surface-emitting and edge-emitting LEDs with proper diagram. (5)

**(ii)** Explain the concept of optical recombination process in brief. (5)

**OR** 10 4 2 2

**Q13 b.**With the help of proper diagram, discuss the effect of temperature on the

fermi level of N- type of semiconductor?

**Q14a.(i)** Write a short note on spontaneous emission rate with the help

of proper notations and diagrams? (5)

**(ii)** Write a short note on Optoelectronic Integrated circuits? (5)

**OR** 10 3 2 1

**Q14b.(i)** A single solar cell(10 cmx 10cm) produces a voltage of 1.0V and a current upto 1.5 A.

If the solar insulation is 600 W/m3. Find the efficiency of solar cell. (5)

**Q14 b.(ii)** Discuss semiconductor materials of interest for optoelectronic devices.(5)

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**SRM Institute of Science & Technology**

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**CYCLE TEST – II**

**Course/Branch:** B.Tech IstSem/CSE **Session:**FN **Subject:** Semiconductor Physics and Computational Methods **Subject Code:** 21PYB102J

**Duration:** 1 hour40mins **Max. Marks:** 50

**Part A (1\*10=10 Marks) Marks BL CO PO**

**Attempt All Questions**

**1.** Forward biasing of a p-n junction 1 2 1 1

A. increases its resistance B. decrease its resistance

C. shorts the junction D. increases the potential difference

**2.** A LED is a heavily doped semiconductor diode that gives 1 1 2 1

light when it is

A. forward biased B. unbiased

C. reverse biased D. None of these

**3.** In the presence of applied field, the average distance travelled by 1 2 2 1

an electron between two successive collisions is known as

A. mean free path B. Drift velocity

C. mobility of electron D. All of above.

**4.** The extrinsic semiconductor the 1 1 2 1

A. number of electrons in conduction band and number of holes in valence band are not equal

B. number of electrons in conduction band and number of holes in valence band are equal

C. number of electrons in conduction band and number of holes in valence band are absent

D. number of holes in conduction band and number of electrons in valence band are equal

**5.**  Edge emitting LED has high 1 1 2 1

A. hole concentration B. efficiency

C. modulation D. attenuation

**6.** When the free electrons and holes gets eliminated it is called as 1 1 2 1

A. recombination B. generation

C. emission D. absorption

7. A monolithic device that contains both photonic and electronic 1 2 2 1

device, sources, detectors etc.on a single semiconductor substrate.

A. optoelectronic device B. opto device

C. ophthalmic device D. electronic device

8. Transition with different k- values is called 1 2 1 1

A. Indirect transitions B. Direct transitions

C. K transitions D. non K transitions

9. Number of atoms making spontaneous emissions 1 2 1 1

per time per volume is given as

A. N21 =A21 N2 B. N12 =A12 N2

C. N12 =B12 N2 D. N12 =C12 N2

10. Joint density of states means density of states in 1 2 2 1

A. conduction band and valence band B. conduction band

C. Valence band D. forbidden gap

**Part B (10\*4=40 Marks) Marks BL CO PO**

**Attempt four Questions**

**11a.** What are LEDs. Explain the principle, construction and working of it with

appropriate diagram?

**OR** 10 5 3 2

**11b.** Define spontaneous and stimulated emission. Derive the relation

showing the ratio of spontaneous to the stimulated emission coefficients.?

**12a.**With the help of proper diagram explain the two biasing concept of

P-N junction. Draw the V-I and V-R characteristics curve?

**OR** 10 4 3 3

**12b.** What does continuity of equation represent? Derive an expression for

continuity equation in case of an n-type semiconductor bar of cross sectional

area A.

**13a.**Discuss the effect of carrier concentration on the fermi level of N-and P-type

semiconductor?

. **OR** 10 5 3 3

**Q13b.** With the help of proper diagram, discuss the effect of temperature on the

fermi level of P- type of semiconductor?

**Q14 a (i)** A single solar cell on illumination by 800W/m2 produces the voltage of 0.5 Volts

and a current of 2.5 A. The efficiency of solar cell is 13%. Calculate the area of the cell? (5)

**(ii)** Write a short note on Organic LEDs (5)

**OR** 10 4 2 2

**Q14 b (i)** Write short note on the Photocurrent in a P-N Junction diode? (5)

**(ii)**Write a short note on stimulated emission rate with the help of proper notations

and diagrams? (5)

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