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## M Phil. DEGREE END SEMESTER EXAMINATION - MARCH 2018 SEMESTER 1 : PHYSICS

COURSE: 16MP1PHYT3; OPTOELECTRONIC DEVICE TECHNOLOGY

(For Regular - 2017 admission)

Time: Three Hours Max. Marks: 75

## Section A Answer any 6 (2 marks each)

- 1. Why are semiconductors used in optoelectronic applications?
- 2. Describe superlattices.
- 3. What are interband transitions.
- 4. What are the different transparent materials used in infrared optoelectronics?
- 5. How is labeling done in electron-electron scattering processes? Explain using examples.
- 6. Explain total overlap factor.
- 7. Describe escape time in terms of Quantum Cascade laser.
- 8. What is optical phonon? Explain the condition for optical phonon.
- 9. What is LED?
- 10. What is a p-n junction? How does it emit light?

 $(2 \times 6 = 12)$ 

## Section B Answer any 3 (5 marks each)

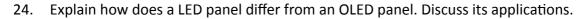
- 11. In which type of semiconductor is the absorption the strongest and why?
- 12. How is the intersubband absorption related to the transition level?
- 13. How is the thickness of bandgap related to intersubband transition?
- 14. How is the sum rule of absorption related to effective mass?
- 15. What are quantum cascade lasers?
- 16. What are the major drawbacks in using OLED technology?

 $(5 \times 3 = 15)$ 

## Section C Answer any 4 (12 marks each)

- 17. Explain the difference between direct and indirect band gap semiconductors in terms of absorption coefficients.
- 18. Explain the origin and effects of confinement in valence band dispersion.
- 19. How does the absorption in coupled well system differ from the single quantum well?
- 20. Discuss in detail the different scattering processes and its comparison with experiments.
- 21. What are intersubband and interband transitions? Compare between them.
- 22. Explain in detail the main features of a quantum cascade laser? What makes it superior to other lasers?

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 $(12 \times 4 = 48)$