

Reg No.: \_\_\_\_\_

Name: \_\_\_\_\_

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
SEVENTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), DECEMBER 2019

**Course Code: EC469**

**Course Name: OPTO ELECTRONIC DEVICES**

Max. Marks: 100

Duration: 3 Hours

**PART A**

*Answer any two full questions, each carries 15 marks.*

Marks

- 1 a) Derive an equation for radiative lifetime for spontaneous band to band recombination. (5)
- b) With the help of suitable diagram discuss band to band absorption and recombination process in semiconductor. (10)
- 2 a) Explain the need for laser cavity. (5)
- b) With the aid of suitable diagram discuss heterojunction laser. Mention two disadvantages of homogeneous laser. (10)
- 3 a) Discuss the principle of exciton absorption and free carrier absorption (7)
- b) Find out total number of longitudinal modes and frequency spacing between the modes of an AlGaAs laser supported by the gain spectrum which has a bandwidth of 6 nm. The laser has a cavity length of 200  $\mu\text{m}$  and the emission wavelength is 800 nm. (Assume  $n_r = 3.6$ ) (8)

**PART B**

*Answer any two full questions, each carries 15 marks.*

- 4 a) Explain the generation of white light using dichromatic light emitting diode (5)
- b) Draw the structure of InGaN/GaN light emitting diodes and discuss the properties of such light emitting diodes (10)
- 5 a) Differentiate between Kerr and Pockel effects (5)
- b) What is meant by electro-optic effect? Explain the working principle of electro-optic phase modulator. (10)
- 6 a) Explain the generation of white light using wavelength convertors (7)

- b) Explain the working principle of electro-absorption with any one type of modulator. (8)

**PART C**

*Answer any two full questions, each carries 20 marks.*

- 7 a) Explain different types of fixed optical filters (10)
- b) Describe the structure of Polymer LED. List the advantages and disadvantages of Polymer LED. (10)
- 8 a) With suitable diagram explain unidirectional and bidirectional WDM transmission system. (10)
- b) A Si APD has a QE of 70 % at 830 nm in the absence of multiplication, that is  $M = 1$ . The APD is biased to operate with a multiplication of 100. If the incident optical power is 10 nW , what is the photocurrent? (10)
- 9 a) Explain different types of add and drop multiplexer. (10)
- b) Describe the structure of thin film transistor display. (10)

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