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 disadvantage 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 μm 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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