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Reg No.: _____

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Seventh Semester B.Tech Degree Examination (Regular and Supplementary), December 2020



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) Briefly explain excitonic transitions in semiconductors. (5)
- 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 $n_r = 3.6$) (10)
- 2 a) Explain Franz-Keldysh effect in semiconductors with necessary diagrams? (5)
- b) Describe absorption in quantum wells and quantum confined stark effect. (10)
- 3 a) Explain the working principle of DFB Lasers with suitable diagrams. (5)
- b) Derive the equation for threshold condition of the laser. (10)

PART B

Answer any two full questions, each carries 15 marks.

- 4 a) Write short notes on Quantum well electro absorption modulators. (10)
- b) With the help of emission spectrum, explain the generation of white light by trichromatic sources. (5)
- 5 a) What is Acousto optic effect? Explain the working of Raman-Nath modulator with neat diagrams. (10)
- b) Discuss the principle of optical memory. (5)
- 6 a) Describe the structure and working of InGaN/GaN laser diodes. (10)
- b) Explain the different types of wavelength converter materials used for white light generation. (5)

PART C

Answer any two full questions, each carries 20 marks.

- 7 a) Explain the different types of directional couplers used for optical field access with figures. (10)

- b) Explain the illumination geometry of microcavity photodiode. (10)
- 8 a) Explain the different types of wavelength converters used for optical field access. (10)
- b) Discuss the structural features and working principle of a PIN photodiode. (10)
- 9 a) A silicon APD has a quantum efficiency of 65% at a wavelength of 900nm. Suppose a $0.5\mu\text{W}$ of optical power produces a multiplied photocurrent of $10\mu\text{A}$, find the multiplication factor M. (7)
- b) Explain the structure and working of LCD. Compare its merits and demerits over LED displays. (8)
- c) Calculate the responsivity of a photodiode if the number of incident photons is 800 and the corresponding electron generation in the photodiode is 500 at a wavelength of 1300nm. (5)
