

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
SEVENTH SEMESTER B.TECH DEGREE EXAMINATION(S), MAY 2019

Course Code: AE409
Course Name: OPTICAL INSTRUMENTATION

Max. Marks: 100

Duration: 3 Hours

PART A

Answer any two full questions, each carries 15 marks.

Marks

- 1 a) Illustrate the principle behind light propagation through an optical fiber with necessary diagrams. (5)
- b) Define Numerical Aperture of an optical fiber. Also derive the expression for numerical aperture. (5)
- c) Differentiate between step index and graded index fiber. (5)
- 2 a) With necessary diagrams explain the operation of a PIN photo diode. (5)
- b) Calculate the V number and number of modes propagating through the fiber having $a = 70 \mu\text{m}$, $n_1 = 1.59$, $n_2 = 1.52$ and $\lambda = 1 \mu\text{m}$. (4)
- c) What is splicing? Mention different types. Explain fusion splicing with neat diagram. (6)
- 3 a) How can distance be measured using interferometers? (7)
- b) Give a short note on fiber optic connectors. (3)
- c) Explain the measurements of current using fiber optic sensors? (5)

PART B

Answer any two full questions, each carries 15 marks.

- 4 a) Describe the working of a Fabry- Perot interferometer. (7)
- b) A Fabry- Perot interferometer has a 1 cm spacing and a reflection coefficient of $r = 0.9$. For a wavelength of 500 nm, Calculate: (8)
 - (i) Mode number
 - (ii) Finesse
 - (iii) Minimum resolvable wavelength interval and
 - (iv) Resolving power.

- 5 a) Flatness testing can be done using interferometry. How it is done? (6)
b) Explain the role of a beam splitter in interferometry with neat diagram. (4)
c) What are the properties of Laser? (5)
- 6 a) Why population inversion is needed for lasing? (5)
b) Classify laser according different criteria. (5)
c) What is the principle of Q-switching? Mention its advantages. (5)

PART C

Answer any two full questions, each carries 20 marks.

- 7 a) How lasers are being engaged in the detection and estimation of atmospheric pollutants? (10)
b) Discuss the method for velocity measurement of a fluid using laser. (6)
c) Describe the use of lasers for the trimming of materials. (4)
- 8 a) How lasers can be utilized for the following applications? (10)
i. Heating
ii. Welding
b) List different applications of Laser in Dermatology? (5)
c) Briefly explain Laser diagnosis. (5)
- 9 a) Explain the interaction between Lasers and Tissues. (8)
b) Discuss the application of lasers in Oncology. (7)
c) Explain the application of lasers in the removal of tumours of vocal chords. (5)
