

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Scheme of Valuation/Answer Key

Scheme of evaluation (marks in brackets) and answers of problems/key

SEVENTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2018

Course Code: EC405

Course Name: OPTICAL COMMUNICATION

Max. Marks: 100

Duration: 3 Hours

PART A

Answer any two full questions, each carries 15 marks.

- | | | Marks |
|---|--|-------|
| 1 | a) Refractive index profile- diagram of single mode & multimode (2 marks) .
Classification of optical fibers with explanation (3 mark) . | (5) |
| | b) About photonic crystal fibers with diagram (2 mark) , classification - Index guiding PCF – explanation (2 mark) , Basic structure- Figure (2 mark) and Photonic band gap fiber – explanation (2 mark) , Figure (2 marks) | (10) |
| 2 | a) Spontaneous emission and Stimulated emission of LASER Figure (1 mark each) + explanation (1.5 mark each) . | (5) |
| | b) About scattering – linear scattering (5 mark) + non-linear scattering (5 mark) , linear – Rayleigh scattering & Mie scattering (equation/ explanation – 2.5 marks), non-linear –SBS & SRS (explanation – 2.5 marks). | (10) |
| 3 | a) Amplifier Spontaneous Emission Noise Explanation (3)
Figure (2) | (5) |
| | b) About dispersion, two types – Chromatic or intramodal dispersion & intermodal dispersion or modal dispersion – explanation (1 + 3 marks) , Signal dispersion figure (2 marks) , Explanation of dispersion in single mode fiber in commercial communication systems (3 mark + 1 mark) . | (10) |

PART B

Answer any two full questions, each carries 15 marks.

- | | | |
|---|--|------|
| 4 | a) IMDD Fig-(2) Explanation (3) | (5) |
| | b) APD Figure with electric field variation (3)
Explanation of avalanche multiplication (4)
Advantages and disadvantages (3) | (10) |
| 5 | a) Concept of link power budget (2.5) and rise-time budget. (2.5) | (5) |



b) Band width X Length =15 MB/sec x 4km= (60Mb/sec) km (10)

Select an optical source LED at a wavelength for short distance

Select optical detector PIN with sensitivity

Select one fiber with bandwidth length product of 100(Mb/s)km

Calculate actual total loss using the equation $(2 \times l_c) + \alpha_f L + P_m$

Find maximum allowable system loss $P_{max} = \text{Optical source out power} -$

Optical receiver sensitivity. If the actual loss in the system are less than the allowable loss, then the system will be a functional system

6 a) Responsivity with equation (2.5 marks)+ quantum efficiency with equation (5marks) (2.5marks)

b) The basic concept of solution generation (4 marks) (10)

Figure (2 marks) and also write the advantages of soliton based communication system (4 marks)

PART C

Answer any two full questions, each carries 20 marks.

7 a) optical Amplifiers- (1) (8)

figure (1.5+1.5), Explanation of Working any two amplifiers { EDFA, SOA, TDFA, Raman amplifier } (4)

b) Any 5 advantages of SOA over EDFA (5 marks) (5)

c) Grating figure (2), Explanation (2) Problem (2marks) (7)

8 a) Tunable optical filter-two types-figure (2) Explanation (3) (5)

b) Working principle of OTDR figure (3 marks) Explanation (4 marks) + (10) refractive index calculation using OTDR (3marks)

c) Principle of Raman Amplifier (3marks) advantages and disadvantages of (5) Raman amplifiers (2 marks)

9 a) Add/drop multiplexers figure (3) , Explanation (3) (6)

b) Working of EDFA (4marks) necessary diagrams (4marks) (8)

c) Explanation of free space optical communication system with figure (4 (6) marks). advantages and disadvantages of the system(2 marks)
