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me :

Fourth Semester B.Sc. Degree Examination, June 2015
(Career Related First Degree Programme Under CBCSS)
Group 2(b) : ELECTRONICS

Core Course EX 1443 : Optical Communication

Max. Marks : 80

me : 3 Hours

PART - A

(Very Short Answer Type)

Answer all questions. One word to maximum one sentence.

1. The most dominant source of inherent radiation loss in a fibre is caused by
2. What are skew rays in a fibre ?
3. What are the basic attenuation mechanisms in a fibre ?
4. The outer jacket provides the fibre _____ and _____.
5. To get a top quality splice, the fibre ends must be cut _____ to the length of the fibre.
6. What is the role of repeaters used in optical network ?
7. What do you mean by mono-mode fibre ?
8. For the higher order modes the fields are distributed towards the edge of the slab wave guide and penetrate in to the
9. What are the advantages of tapering ?
10. The information carrying capacity of the fibre is greatly enhanced by a process called

(10×1=10 Marks)

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PART – B

(Short answer)

Not to exceed **one** paragraph. Answer **any 8** questions. **Each** question carries 4 marks.

11. What is the role of cladding in optical fibre ?
12. What do you mean by V number ?
13. What are the drawbacks of SOA ?
14. What are the major building blocks of an optical communication system ?
15. What do you mean by intrinsic losses ?
16. Explain the refractive index profile of a graded index fiber.
17. What are the features of strength member used in optical fibre cable ?
18. Discuss fibre bend loss.
19. Write short note on optical loss encountered at fibre-fibre interfaces.
20. What do you mean by wave guide dispersion ?
21. Explain the concept of star coupler.
22. What are the advantages and disadvantages of optical communication system ?

(8x2=16)

PART – C

(Short Essay)

Not to exceed **120** words. Answer **any 6** questions. **Each** question carries 4 marks.

23. Explain the different steps involved in slicing procedure.
24. Briefly explain acceptance cone.
25. What do you mean by index profile ?
26. Discuss various types of coupling.
27. Explain how light propagates in a fibre.

- What do you mean by the rise time budget ?
- What do you mean by pulse dispersion ?
- Discuss the various losses in single mode fibre.
- Write short note on WDM.

(6×4=24 Marks)

PART - D
(Long Essay)

Answer any 2 questions. Each question carries 15 marks.

- a) A silica optical fibre with a core refractive index of 1.50 and a cladding refractive index of 1.47, determine the critical angle at the core-cladding interface and also find the numerical aperture of the fibre.
- b) What do you mean by total internal reflection ?

Write short notes on :

- a) Fiber optic network
- b) Point to point link

With figures explain the various types of losses associated with splicing techniques. What do you mean by optical fibre connector ?

Explain how amplification occurs in Erbium Doped Fiber Amplifier ? Compare EDFA with SOA ?

(2×15=30 Marks)

(Pages : 4)

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Reg. No. :3401805006.....

Name :Binu.A.P.21.....

Sixth Semester B.Sc. Degree Examination, April 2022

Career Related First Degree Programme under CBCSS

Group 2(b)-Electronics

Core Course

Ex 1641 : OPTICAL COMMUNICATION

(2019 Admission)

Time : 3 Hours

Max. Marks : 80

SECTION – A

Answer all questions. Each question carries 1 mark.

1. Which materials are used for fabrication of inner core of an optical fiber?
2. Name the ray that passes through the axis of the fiber core.
3. Which kind of dispersion phenomenon gives rise to pulse spreading in single mode fibers?
4. What is the full form of LASER?
5. Which type of scattering occurs due to interaction of light in a medium with time dependent optical density variations thereby resulting into the change of energy (frequency) and path?
6. What is the use of an index-matching material in the connector between the two jointed fibers?

P.T.O.

7. On which factors does the response time of photodiode depends?
8. Which wavelength is most suitable for pumping an erbium doped fiber amplifier?
9. Which mechanism is used in laser technology for generation of light?
10. The long cut-off wavelength of GaAs is $0.923 \mu m$. Determine band gap energy.

SECTION – B

(10 × 1 = 10 Marks)

Answer any **eight** questions. Each question carries 2 marks.

11. Mention the advantages of optical fiber communication system.
12. What is the difference between radiative and non-radiative recombination?
13. Why is the bandwidth of optical fiber high?
14. Draw structure of an optical fiber cable and mark parts.
15. What is meant by the zero dispersion wavelength?
16. What is the difference between intrinsic absorption and extrinsic absorption?
17. State Snell's Law.
18. What is the advantage of fusion splicing over mechanical splicing?
19. What do you mean by the term modulation in a fiber optic system?
20. Discuss about the sources of errors in an optical receiver.
21. What are the factors on which the polarization mode dispersion depends?
22. Explain why hetero junction structure is preferred in fabricating LED and LD.
23. What is the significance of intrinsic layer in PIN photodiode?

24. Calculate the responsivity of a detector having a quantum efficiency of 15% at $0.8\mu\text{m}$.
25. What is stimulated emission of radiation in a laser?
26. Discuss the concept of link power budget.

(8 × 2 = 16 Marks)

SECTION – C

Answer any **six** questions. Each question carries 4 marks.

27. A multimode step indexed silica optical fibre has a core refractive index of 1.48 and relative refractive index difference of 0.27%. Calculate critical angle at core-cladding interface and also find numerical aperture.
28. Using figure explain the concept of acceptance cone.
29. How does the ray of light propagate in a graded index fiber? Explain with suitable diagram.
30. Summarize the main differences between multimode and single-mode fibers.
31. Describe about waveguide dispersion.
32. What is bandwidth in optical communication? What limits the bandwidth in optical fiber?
33. Explain the characteristics of various light carrying transmission systems.
34. Discuss about various types of fiber connectors.
35. What is V groove splicing? Explain with figure.
36. Explain with the help of neat diagram working of a PN junction diode as a photo detector.
37. Discuss the basic principle and operation of distributed feedback laser.
38. What is meant by responsivity? How it is related to quantum efficiency?

(6 × 4 = 24 Marks)

SECTION – D

Answer any **two** questions. Each question carries **15** marks.

39. Discuss the structure, refractive index profile and performance characteristics of step index fiber and graded index fiber.
40. Draw a neat diagram and explain the ray theory behind the optical fiber communication with a special mention about the total internal reflection, acceptance angle and numerical aperture.
41. Describe various types of attenuation losses in optical fiber. Explain any two losses with diagram.
42. Draw block diagram of a generalized point to point transmission system and explain.
43. Sketch the structure of an EDFA and explain the function of each component.
44. Describe with the aid of suitable diagrams the mechanism giving the emission of light from LED. Also write about internal quantum efficiency and external quantum efficiency of a LED.

(2 × 15 = 30 Marks)

PART – B

Q. 17 – 28) : Answer **any 8** questions. **Each** questions carries a weight of **one**.

1. What is the purpose of cladding ?

2. Define V. number.

3. What do you mean by skew wave in a fiber ?

4. List few disadvantages of the all plastic fiber.

5. List few steps to be taken while designing a fiber to reduce bending losses.

6. What is fusion splicing technique ?

7. What do you mean by mode coupling ?

8. With diagram, explain the basic blocks of optical communication system.

9. List few functions of optical receiver.

10. What is WDM ? What is the need of WDM ?

11. Explain the effects of material dispersion.

12. List few draw backs of single mode fiber.

PART – C

(Q. No. 29 – 36) : Answer **any 5** questions. **Each** question carries a weight of **two**.

29. Compute the N.A. and the acceptance angle of an optical fibre from the following data, μ_1 (core) = 1.55 and μ_2 (cladding) = 1.50.

30. Explain the following terms :

a) Total internal reflection

b) Critical angle.

31. With diagram explain the concept of T.D.M.

32. Explain various types of coupling used in optical fibers.

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33. What do you mean by intermodal dispersion ?
34. Explain the concept of optical amplifiers.
35. What is optical fiber network, explain ?
36. List few characteristics of optical fiber cable ?

PART - D

(Q. No. 37 - 39) : Answer **any 2** questions. **Each** question carries a weightage of 10 marks.

37. What are the different attenuations in an optical fiber ? What are the steps taken to minimize attenuation ?
 38. What do you mean by index profile and explain what is the effect of index profile on propagation ?
 39. Write short note on :
 - a) EDFA
 - b) Pulse dispersion and band width limitation.
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No. :

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Fourth Semester B.Sc. Degree Examination, July 2017
Career Related FDP under CBCSS

Group 2(b) - ELECTRONICS

Core Course : EX - 1443 : Optical Communication
(2015 Admn.)

e: 3 Hours

Total Marks : 80

SECTION - A

(Very Short Answer Type)

Answer all questions. One word to maximum one sentence.

1. What is the concept behind WDM technique ?
2. What do you mean by quantum nature of light ?
3. What are bending losses ? Name any two types.
4. Identify the causes for scattering loss.
5. Mention mechanism of absorption losses in optic fibre.
6. Mention different types of fibre coupling.
7. What is meant by intermodal delay ?
8. How does population inversion take place in laser diode ?
9. What is V-groove splice technique ?
10. What are quantum-well lasers ? (10x1=10 Marks)

SECTION - B

(Short Answer)

Not to exceed one paragraph. Answer any 8 questions. Each question carries 2 marks.

11. Mention about different types of polarisation of light.
12. Describe about quantum nature of light.

13. Describe the role of refractive index as the fundamental optical parameter.
14. What is meant by Mode Field Diameter (MFD) ?
15. Explain about the reason for scattering losses in optic fibers.
16. If refractive indices of core and cladding of a silica fiber are 1.48 and 1.46 respectively. Find the numerical aperture of the fiber.
17. What are the different materials used in the construction of optic fibers?
18. Briefly explain about fiber connector return loss.
19. Explain about the need for modulation in laser diodes.
20. Write about any one principle of photo detector.
21. Briefly explain about the classes of optical amplifiers.
22. Large Bandwidth is obtained in optical communication. Explain. (8x)

SECTION - C

(Short Essay)

Not to exceed 120 words. Answer any 6 questions. Each question carries 4 marks.

23. Describe about step index fiber structure.
24. Briefly explain about the construction of single mode fibers.
25. Explain fusion splicing with a neat diagram. What are the advantages of fusion splicing over other types splicing ?
26. Explain about the structure of graded index fiber.
27. Explain attenuation and losses in fiber.
28. Briefly discuss about basic fiber optic cable structure.
29. Briefly explain about signal distortion in fibers.
30. Explain briefly about intramodal dispersion.
31. Briefly discuss about laser diode structure. (6x4=24)

SECTION - D

Answer any 2 questions. Each question carries 15 marks.

2. Explain about optical different fiber modes and configuration. Discuss about power flow in step index fibers.
3. Explain about refractive index profiles in optic fibers. Discuss about polarization mode dispersion.
4. Discuss about lensing schemes for improvement of coupling. Explain about laser diode to fiber coupling.
5. Explain about the operating principles of semiconductor optical amplifiers. Discuss about the amplification mechanism of EDFA.

(2x15=30 Marks)



Roll No. :
 Date :
 Fourth Semester

B.Sc. (Electronics) Degree Examination, June 2016
Career Related FDP under CBCSS
Group 2 (b)
EX 1443 : OPTICAL COMMUNICATION
(2013 Admission)

Max. Marks : 80

Time : 3 Hours

PART - A

Answer all questions. **Each carries 1 mark.**

1. Define the term switching in a fiber optic network.
2. Write down the refractive index of any four mediums.
3. List any three disadvantages of mono-mode fibre.
4. What is an in-line amplifier ?
5. Define the terms wavelength and frequency.
6. What is scattering loss ?
7. Discuss few merits of TDM.
8. Define critical angle.
9. Write down any four advantages of optical fiber communication system over the copper wire systems.
10. List any three types of optical fiber couplers.

(10×1=10 Marks)

PART - B

Answer any 8 questions (11-22) given below, **each question carries 2 marks.**

11. What is dispersion ?
12. What is circuit switching ?

P.T.O.

13. Define acceptance cone.
14. What are the requirements for a good connector?
15. What are absorption losses?
16. Discuss the core index structure of a graded index fiber.
17. What is V number and what is its importance?
18. Sketch the diagram of light incident on a glass-air boundary, as greater than n_2 (air).
19. What is WDM?
20. List the different types losses in fiber to fiber connection.
21. Mention few advantages and drawbacks of SOA?
22. Discuss the two types of rays that can propagate through an optical fiber. (8)

PART - C

Answer any 6 questions (23-31) given below, each question carries 4 marks

23. Calculate the refractive indices of the core and the cladding material of an optical fiber from the following data, $N.A = 0.22$ and $\Delta = 0.012$.
24. Discuss the concept of optical fiber networks.
25. Write short note on mode coupling.
26. What is erbium doped fiber amplifier?
27. Discuss the terms :
 - a) total internal reflection
 - b) numerical aperture.
28. Explain the block diagram of an optical communication system.
29. Write short note on optical fiber coupler.

Compare a multimode step index fiber with a multimode graded index fiber.

Derive the expression for acceptance angle of an optical fiber. (6×4=24 Marks)

PART - D

Answer any 2 questions (32-35) given below, each question carries 15 marks.

2. Explain the concept of a semiconductor optical amplifier. Discuss the gain of a FPA type of SOA. (12+3)

3. Discuss with figures, any two splicing techniques used to join fiber.

4. Discuss the core index profile for any three different types of optical fiber cables.

5. Discuss the concept of wavelength division multiplexing in fiber optic communications. (2×15=30 Marks)