

B.E. Sem. VIII - EXTE (REV)
Optical Fiber Communication
2610512015

QP Code : 8184

(3 Hours)

[Total Marks : 100]

- N.B. 1 Question No. 1 is compulsory
2 Attempt any four questions from the remaining six questions
3 Assume suitable data wherever necessary and justify the same

1. a Draw the refractive index profile with dimensions of different types of fiber 5
b Describe the concept of WDM 5
c Distinguish Spontaneous and Stimulated Emission 5
d Describe the Eye diagram as applicable to optical fiber Communications 5
- 2 a Explain any one fiber fabrication process with neat diagram. Compare the different methods of fabrication. 10
b Starting from Maxwell's equation derive the wave equation for Step Index Fiber. 10
- 3 a Explain the Signal Attenuation in optical fiber and plot the three windows. 10
b Describe the intermodal delay and intramodal dispersion in optical fiber. 10
- 4 a Describe with diagram the structure of a distributed feedback laser diode. 10
b A silicon avalanche photodiode has a quantum efficiency of 65 percent at a wavelength of 900 nm. Suppose 0.5 μ W of optical power produces a multiplied photocurrent of 10 μ A. Find the multiplication M. 10
- 5 a Describe the different types of pre amplifiers used in optical receivers. 10
b Explain with diagram the setup for making pulse dispersion measurements in time domain. 10
- 6 a Why Link Power Budget is important in optical fiber communication systems? Explain with an example. 10
b Explain the different types of detections in Coherent systems. 10
- 7 Write short notes on any four
a OTDR 5
b Fiber materials 5
c Zero dispersion wavelength 5
d Linearly polarised modes 5
e Mode coupling 5

(3 Hours)

[Total Marks : 100

- N.B. (1) Question no. 1 is compulsory.
(2) Solve any four from the remaining.
1. (a) Explain ADSL configuration management 5
(b) Describe RMON standard 5
(c) Describe various parameters of managed objects. 5
(d) What are challenges faced by network managers while managing a network 5
 2. (a) What is fault management? Describe five steps process in fault management. 10
(b) Explain physical architecture of TMN 10
 3. (a) Explain all CMISE services in following categories: 10
(i) Management association services
(ii) Management notification services
(b) Write a note on management information tree 10
 4. (a) Distinguish between SNMPV2 and CMISE services 10
(b) Discuss Network management tools 10
 5. (a) Explain user security model of SNMPV3. 5
(b) List various event correlation techniques and explain an one in detail. 5
(c) Discuss M1, M2 and M4 interface in ATM network management 10
 6. (a) Explain configuration management with respect to network provisioning and network topology. 10
(b) Explain role of ADSL access network in overall network 10
 7. Write short note on:-
 - (i) Network management tools 7
 - (ii) Semi Formal and formal notations 5
 - (iii) SNMP V3 applications 8
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- N. B. : (1) Question No. 1 is **compulsory**.
 (2) Answer any **four** out of remaining.
 (3) Assume suitable data if necessary with justification.

1. Answer the following (any four) :- 20
- (a) Why should the satellite velocity at the apogee point always be less than the velocity at the perigee point.
 - (b) Explain why is it not possible to have an elliptical satellite orbit with zero eccentricity.
 - (c) Why do we need to have an isotropic antenna on board the satellite?
 - (d) Compare and contrast prime focus fed parabolic reflector antenna, offset feed parabolic reflector antenna and cassegrain antenna for use as an Earth station antenna.
 - (e) Explain what is meant by orthogonal polarization and the importance of this in satellite communication.
2. (a) How do you define an "orbital cycle" in the case of a satellite in a sun-synchronous orbits? What is its significance when it comes to earth observation application? 6
- (b) Briefly describe the important characteristics and the preferred uses of the following orbits. 6
- (i) Molniya orbit
 - (ii) Sun-synchronous orbit
 - (iii) Geostationary orbit
- (c) With the help of a block diagram briefly describe the functions of the important constituent part of a typical large size earth station. 8
3. (a) Explain the propagation impairment which most affect transmission in the C-band and ku-band. 8
- (b) Why is Faraday rotation of no concern with circularly polarized waves? Explain how depolarization is caused by rain. 6
- (c) What do you understand by link budget of a satellite communication link? What type of information do you get from such an analysis. 6
4. (a) Explain in detail the operation of the SPADE system of demand assignment. What is the function of the common signalling channels? 10
- (b) Describe the TTC facilities of a satellite communication system. 10

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5. (a) Derive equation for carrier-to-noise ratio. 6
(b) Explain :- 8
 (i) Input back off and out put back off
 (ii) Uplink rain-fade margin and down link rain-fade margin.
(c) Define and explain the term 1-dB compression point. What is the significance of this point in relation to the operating point of a TWTA? 6
6. (a) Explain network synchronization in TDMA system. 10
(b) Explain what is meant by the term despun antenna and briefly describe any one way in which the despinning is achieved? Briefly describe the three-axes method of satellite stabilization. 10
7. Write short notes on (any four) :- 20
 (a) Reliability and space qualification
 (b) Electrical power sub-system
 (c) Tracking Technique used in satellite
 (d) AM to PM conversion
 (e) Orbital parameters
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(3 Hours)

[Total Marks : 100]

- N.B.:
- (1) Question No. 1 is compulsory.
 - (2) Attempt any four out of remaining six questions.
 - (3) Assume suitable data wherever necessary and state it.
 - (4) Figures to the right indicate marks.

1. Justify/contradict following statements :— 20
- (a) If Kernel of an image transform is separable and symmetric, the transform can be expressed in matrix form.
 - (b) Walsh transform is nothing but sequency ordered Hadamard matrix.
 - (c) Laplacian is good edge detector.
 - (d) Mixed adjacency is introduced to eliminate the ambiguities that often arise when 8-adjacency is used.

2. (a) Write differences between spatial and tonal resolution. 6
- (b) Equalize the following histogram. 8

GL.	0	1	2	3	4	5	6	7
No. of pixels	100	90	50	20	0	0	0	0

- (c) State and prove separable property of DFT. 6
3. (a) Using graph Theoretical Approach, find the edge for following 3X3 image starting from first row and ending on last row. 10

$$\begin{bmatrix} 5 & 6 & 7 \\ 3 & 4 & 2 \\ 0 & 1 & 7 \end{bmatrix}$$

Find the edge corresponding to minimum cost path.

- (b) Name and explain different types of redundancies in a digital image. 8
- (c) Classify the following compression techniques into lossy and loss less. 2
- (i) IGS
 - (ii) Run length coding
 - (iii) Transform coding
 - (iv) DPCM

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4. (a) Explain basic principles of detecting following in the images 10
- (i) Points
 - (ii) Lines
 - (iii) Edges

Give 3X3 mask for each of them and explain their operation.

- (b) Explain dynamic range compression. 5
- (c) What is IGS Coding ? How it is useful in data compression ? 5

5. (a) Given below is the table of 8 symbols and their frequency of occurrence. 10

Symbol	s_0	s_1	s_2	s_3	s_4	s_5	s_6	s_7
Frequency	0.25	0.15	0.06	0.08	0.21	0.14	0.07	0.04

Give Huffman code for each eight symbols

Calculate entropy of the source

Find its average length

Calculate the efficiency of the code obtained in 5(a).

- (b) Explain why Huffman coding is not unique. 5
- (c) Compare histogram equalization and contrast stretching. 5
6. (a) Obtain 2D Hadamard Transform of the image segment shown below. 5

2	1	0	3
1	1	2	3
2	4	0	3
1	1	1	1

- (b) Explain Homomorphic filtering in detail. 5
- (c) Encode the following by using Arithmetic coding {a, b, b, c, c} 10
7. Write short note on any **three** of the following :— 20
- (a) Image compression model
 - (b) Image degradation model
 - (c) Image enhancement in frequency domain
 - (d) DCT and its application in image processing.

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[Total Marks : 100

- N.B. :** (1) Question No.1 is compulsory.
 (2) Make use of complete Smith chart wherever necessary.
 (3) Solve any four questions from remaining six questions.
 (4) Assume suitable data wherever required.

- 1.(a) Find S-parameters of two port series network with $Z = 100 \Omega$ and $Z_0 = 50 \Omega$. 5
 (b) Derive the expression of overall noise figure in three cascaded stages of amplifiers. 5
 (c) Define stability. List the various criteria for stability. 5
 (d) What are the characteristics of power amplifiers ? 5

2. (a) A BJT with $I_c = 30\text{mA}$ and $V_{CE} = 10\text{V}$ is operated at a frequency of 1.0 GHz in a 50Ω system. 10

Its S-parameters are :

$$S_{11} = 0.73 \angle 175^\circ; \quad S_{22} = 0.21 \angle -80^\circ$$

$$S_{12} = 0.0; \quad S_{21} = 4.45 \angle 65^\circ$$

Determine whether the transistor is unconditionally stable. If yes, calculate the optimum terminations.

G_s , max, G_L , max and G_{TU} , max.

- (b) Explain using suitable diagrams two methods of designing broad band amplifier. 10

3. (a) Determine stability of GaAs FET that has the following S-parameters at 2GHz in a $50\text{-}\Omega$ system both graphically and mathematically. 10

$$S = \begin{bmatrix} 0.89 \angle -60^\circ & 0.02 \angle 62^\circ \\ 3.1 \angle 123^\circ & 0.78 \angle -27^\circ \end{bmatrix}$$

- (b) Derive the transducer power gain as : 10

$$G_T \frac{P_L}{P_{avg}} = \frac{|S_{21}|^2 (1 - |S_{11}|^2) (1 - |S_{22}|^2)}{|1 - S_{11} \Gamma_{in}|^2 |1 - S_{22} \Gamma_L|^2}$$

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4. Design a transistor oscillator at 6GHz using an FET in CS configuration driving a 50 Ω load on drain side. The S parameters at 50 Ω are 10

$$S = \begin{bmatrix} 0.9 \angle 150^\circ & 0.2 \angle -15^\circ \\ 2.6 \angle 50^\circ & 0.5 \angle 105^\circ \end{bmatrix}$$

Calculate and plot output stability circle for

$|\overline{\Gamma}_{IN}| \gg 1$, choose $\overline{\Gamma}_T$ so that $|\overline{\Gamma}_{IN}| \gg 1$

Design load and terminating networks.

5. (a) Discuss various mixer topologies. Compare performance of various topologies. 10
 (b) Compare microwave amplifiers with microwave oscillators. 10
6. (a) A GaAs FET is biased for minimum noise figure and has following S parameters and noise parameters at 4GHz ($Z_0 = 50\Omega$) 15

$$S = \begin{bmatrix} 0.6 \angle -60^\circ & 0.05 \angle 26^\circ \\ 1.9 \angle 81^\circ & 0.5 \angle -60^\circ \end{bmatrix}$$

$$F_{min} = 1.6\text{dB}, \overline{\Gamma}_{opt} = 0.62 \angle 100^\circ, R_N = 20\Omega$$

Design an amplifier with 2dB noise figure and maximum gain compatible with this noise figure. Assume device is unilateral.

- (b) prove that scattering matrix is symmetrical and reciprocal. 5

7. Write short notes on :

- (a) Noise figure test equipment 5
 (b) 1dB compression point 5
 (c) Amplifier linearization methods 5
 (d) Single ended diode mixer. 5

B.G. ~~SEM~~ EXTG Sem VIII (Ren) M/J-2015
01-06-15
Sub: - Wireless N/w.

QP Code : 8333

(3 Hours)

[Total Marks : 100

N.B. (1) Question no. 1 is compulsory.

(2) Answer any four questions from the remaining six questions

(3) Assume suitable data wherever necessary with justification

1. (a) Compare WAP and internet protocol stacks. 5
(b) Compare CSMA-CD and CSMA-CS protocols 5
(c) Give definitions of scatter net, MAC address, parked units, sniff and hold mode. 5
(d) Draw and explain neat diagram of components of sensor nodes. 5
2. (a) Describe in detail LR-WPAN device architecture with suitable diagram 10
(b) Draw the spectrum of ultrawide band signal compared to Wi-Fi 802.11a signal. also explain radio frequency identification in detail. 10
3. (a) Give the detailed radio Access Network Overview. Explain in detail functions of Node B and RNC. also draw UTRAN logical architecture. 10
(b) What is adaptive multirate (AMR) coded? comment on Quality of service in UMTS with respect to Qos attributes. 10
4. (a) Calculate the uplink cell load factor and number of voice users for a WCDMA system using the following data. What is the pole capacity of the cell? 10
- Information rate (Ri) = 12.2kbps
- Chip rate (Rc) = 3.84 mcps
- Required Eb/N = 4 dB
- Required interference margin = 3dB
- Interference factor due to other cells = 0.5
- Channel activity factor: 0.65
(b) Explain link budget analysis and requirements of wireless networks. 10
5. (a) Explain imode protocol stack. Also discuss programming model of WAP in detail. 10
(b) Explain various in bluetooth connection establishment. Draw a complete flow diagram. 10
6. (a) Explain transmit and receive DSSS PPDU with frame structure in detail. 10
(b) Explain reverse link features of CDMA 2000. 10
7. Write short notes on:- 20
(a) HSDPA
(b) Rake Receives
(c) 802.11 std of wireless LAN
(d) WiMax