CBCS SCHEME

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15EC81

Eighth Semester B.E. Degree Examination, November 2020
Wireless Cellular and LTE 4G Broadband

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions irrespective of modules.

Module-1

1 a. With a neat block diagram, explain LTE network architecture and describe briefly the new elements provided in it. **(08 Marks)**

b. Explain Cellular concept. Discuss how interference can be reduced in cellular communication. **(08 Marks)**

2 a. Explain the steps involved in developing a statistical model. Discuss any one type of model. **(08 Marks)**

b. Explain the techniques used for mitigating narrow band fading. **(08 Marks)**

Module-2

3 a. With a neat diagram, explain the Orthogonal Frequency Division Multiplexing (OFDM) used in LTE. **(08 Marks)**

b. What is PAR problem? Explain the methods used for PAR reduction. **(08 Marks)**

4 a. Explain the concept of Diversity gain and Array gain. **(08 Marks)**

b. Explain receive diversity combining algorithm. **(08 Marks)**

Module-3

5 a. Discuss the various design principles used in LTE specification. **(08 Marks)**

b. Discuss the Radio Interface protocol layers of LTE. **(08 Marks)**

6 a. With a neat sketch, explain the frame structure used in LTE. **(08 Marks)**

b. Discuss down link transport channel processing. **(08 Marks)**

Module-4

7 a. Discuss channel coding for up – link channel information. **(08 Marks)**

b. Briefly explain up – link reference signals and resource mapping of them. **(08 Marks)**

8 a. Explain Channel Quality Indicator (CQI) feed back with the help of CQI estimation and reporting modes. **(08 Marks)**

b. Discuss Random Access Procedures used in LTE. **(08 Marks)**

Module-5

9 a. Discuss the main functions and services of PDCP sub layers for user plane and control plane. **(08 Marks)**

b. Explain the functions and services of RLC and MAC layers. **(08 Marks)**

10 a. With a neat flow diagram, explain Mobility Management over X_2 interface. **(08 Marks)**

b. Discuss briefly methods used to mitigate Inter Cell Interference (ICI) in uplink and down link. **(08 Marks)**

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15EC82

Eighth Semester B.E. Degree Examination, July/August 2021
Fiber Optics and Networks

Time: 3 hrs. Max. Marks: 80

Note: *Answer any FIVE full questions.*

1 a. Explain with a neat diagram an optical fiber communication system. **(06 Marks)**

b. Derive an equation for numerical aperture for a step index fiber using Snell's law. **(07 Marks)**

c. A silica optical fiber with a core diameter large enough to be considered by ray theory analysis has a core refractive index of 1.50 and cladding refractive index of 1.47. Determine:
   i) Critical angle at the core – cladding interface
   ii) The numerical aperture for the fiber
   iii) The acceptance angle in air for the fiber. **(03 Marks)**

2 a. Discuss the advantages of optical fiber communication. **(05 Marks)**

b. Explain photonic crystal fibers. **(07 Marks)**

c. A graded index fiber has core with a parabolic refractive index profile which has a diameter of 50μm. The fiber has a numerical aperture of 0.2 estimate the total number of guided modes propagating in the fiber when it is operating at a wave length of 1μm. **(04 Marks)**

3 a. Explain intrinsic and extrinsic absorption losses. **(06 Marks)**

b. Explain fiber bending losses with the help of neat diagrams. **(06 Marks)**

c. When the mean optical power launched into an 8km length of fiber is 120μw, the mean optical power at the fiber output is 3μw. Determine :
   i) The overall signal attenuation or loss in the decibels through the fiber assuming there are no connectors or splices.
   ii) The signal attenuation per kilometer for the fiber
   iii) The overall signal attenuation for a 10km optical link using the same fiber with splices at 1km intervals, each giving an attenuation of 1dB
   iv) The numerical input/output power ration in (iii). **(04 Marks)**

4 a. Derive an expression for r.m.s pulse broadening due to intermodal dispersion in a step index fiber. **(06 Marks)**

b. Explain three types fiber splicing techniques with neat diagrams. **(06 Marks)**

c. An optical fiber has a core refractive index of 1.5. Two lengths of the fiber with smooth and perpendicular (to the core axis) end faces are butted together. Assuming the fiber axis are perfectly aligned, calculate the optical loss in decibels at the joint (due to Fresnel reflection) when there is a small air gap between the fiber end faces. **(04 Marks)**

5 a. With neat sketch, explain GaAs homo-injection LASER Fabry – Perot cavity. **(06 Marks)**

b. Derive an expression for quantum efficiency and LED power. **(06 Marks)**

c. Discuss the operation of PIN photodetector with appropriate diagrams. **(04 Marks)**

6 a. With a neat schematic diagram, explain the working of an optical receiver. (06 Marks)
b. Explain the different types of front end amplifiers in an optical receiver. (06 Marks)
c. A double – heterojunction In GaAsP LED emitting at a peak wavelength of 1310nm has radiative and nonradiative recombination times of 30 and 100ns, respectively. The drive current is 40mA. Calculate : i) bwk recombination lifetime ii) internal quantum efficiency iii) internal power. (04 Marks)

7 a. With the help of neat diagram, explain the operation of WDM (Wavelength Division Multiplexing). (08 Marks)
b. Derive an equation for path difference in a 2 × 2 Mach – Zehnder interferometer. (08 Marks)

8 a. Explain the operation of polarization independent isolator. (06 Marks)
b. Explain the three possible configurations of an EDFA (Erbium doped Fiber amplifiers). (10 Marks)

9 a. Briefly discuss the evolution of optical networks indicate the significant features of the optical network generations. (06 Marks)
b. Describe the concept of OXC (Optical Cross Connect) and a ROADM (Reconfigurable optical add/drop multiplexer) outline how they are utilized in the development of large scale wavelength division multiplexed networks. (06 Marks)
c. Define what is ATM(Asynchronous Transmission Mode) and its application in optical networks. (04 Marks)

10 a. Describe the purpose and the layered structure of Open System Interconnection (OSI) reference model. (08 Marks)
b. Outline the main features of the optical transport network and describe its hierarchy as specified by ITU-T. (08 Marks)

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