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17EC81

Eighth Semester B.E. Degree Examination, July/August 2022
Wireless Cellular and LTE 4G/Broadband

Time: 3 hrs.   Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Discuss the advantages of OFDM, which made it to use in LTE technology. **(10 Marks)**
   b. With neat sketch, Interpret the importance of each module of Evolved packet core architecture of LTE. **(10 Marks)**

OR

2 a. Explain Adaptive modulation and coding with neat Block diagram. **(10 Marks)**
   b. Analyse the techniques used to mitigate the Broadband fading. **(10 Marks)**

Module-2

3 a. State the importance of timing synchronization used to demodulate an OFDM signal. **(08 Marks)**
   b. With neat block diagram, analyze the principle operation of OFDMA in downlink transmitter. **(08 Marks)**
   c. List advantages of OFDMA. **(04 Marks)**

OR

4 a. Explain Spatial diversity of multiple antenna technique. **(06 Marks)**
   b. With neat block diagram, explain SC-FDMA uplink transmitter and receiver. **(10 Marks)**
   c. Compare FDMA, TDMA and CDMA. **(04 Marks)**

Module-3

5 a. Interpret the basic design principles of LTE. **(10 Marks)**
   b. Sketch LTE architecture and explain components of the E-UTRAN and EPC. **(10 Marks)**

OR

6 a. With neat structure of downlink resource grid, explain different resource units. **(10 Marks)**
   b. Explain Frame structure type – 2 in detail. **(10 Marks)**

Module-4

7 a. In detail, discuss the channel coding procedure for uplink control information. **(12 Marks)**
   b. Write note on H-ARQ in the uplink. **(08 Marks)**

OR

8 a. Explain Non-synchronized Random access procedures in LTE. **(10 Marks)**
   b. Explain the seven different transmission modes defined for PDSCH channel. **(10 Marks)**

Module-5

9 a. Discuss the different fields of RLC PDU formats. **(12 Marks)**
   b. Explain the main services and functions of the PDCP sublayer. **(08 Marks)**

OR

10 a. What is X2 Interface? With neat flow diagram, explain mobility management over X2 interface. **(12 Marks)**
    b. Interpret the interaction between MAC and RLC sublayer along with three data transfer modes. **(08 Marks)**

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Eighth Semester B.E. Degree Examination, July/August 2022
Fiber Optics and Networks

Time: 3 hrs.   Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. With help of neat diagram, explain the main block of an optical fiber communication.
      (10 Marks)
   b. Explain the advantages, disadvantages and applications of OFC.   **(10 Marks)**

OR

2 a. With a neat diagram, discuss the structure of single mode and multimode step index fiber with advantages of each type.   **(10 Marks)**
   b. Calculate the R.I of core and cladding materials of an fiber whose NA = 0.35 and $\Delta = 0.001$.   **(04 Marks)**
   c. A step-index multimode fiber with NA = 0.20 supports 1000 modes at 850nm. What is diameter of core? How many does the fiber supports at 1320nm.   **(06 Marks)**

Module-2

3 a. Explain different absorption mechanism in optical fiber.   **(10 Marks)**
   b. Silica has an estimated fictive temperature of 1400K with an ISO thermal compressibility of 7×10^{-11} m^{2}N^{-1}. RI and photo elastic coefficient for silica are 1.46 and 0.286 respectively. Determine attenuation in dB/km due to Rayleigh scattering in silica at $\lambda = 0.65$, 1 and 1.3km, K = Boltzman constant = 1.381×10^{-23}JK^{-1}.   **(10 Marks)**

OR

4 a. Discuss inter modal dispersion with necessary equations.   **(10 Marks)**
   b. Explain Macro and Micro bending losses with a neat diagram   **(10 Marks)**

Module-3

5 a. Draw the diagram of a typical GaAiAS double hetro structure LED along with energy band diagram and refractive index profile and explain.   **(10 Marks)**
   b. Discuss internal quantum efficiency and power in detail.   **(10 Marks)**

OR

6 a. Explain Fabry-Perot resonator cavity of laser with a neat diagram.   **(10 Marks)**
   b. Explain the following:
      i)   Spontaneous emission
      ii)   Stimulated emission
      iii) Quantum efficiency.   **(06 Marks)**
   c. For an alloy In$_{0.74}$ + Ga$_{0.26}$ As$_{0.57}$ P$_{0.43}$ used in LED find wavelength emitted by the source.   **(04 Marks)**

Module-4

7 a. Explain the implementation of WDM networks with various types of optical amplifiers.

(10 Marks)

b. Explain MZI multiplex with necessary equations. (10 Marks)

OR

8 a. Describe the principles of working of isolators and circulators, with a neat diagram.

(10 Marks)

b. With help of neat diagram, explain three possible EDFA configurations. (10 Marks)

Module-5

9 a. Discuss in detail about optical networking terminology. Mention the merits and demerits of each. (10 Marks)

b. Describe optical networking node elements with a neat diagram. (10 Marks)

OR

10 a. Explain the concept of wavelength routing with appropriate diagrams. (10 Marks)

b. With a neat diagram, explain the public telecommunication network overview (10 Marks)

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Eighth Semester B.E. Degree Examination, July/August 2022
Radar Engineering

Time: 3 hrs.   Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Explain conventional pulse radar with super heterodyne receiver with a neat block diagram. **(08 Marks)**

   b. A radar is expected to detect a target of cross sectional area of $5m^2$. The antenna used is a parabolic dish of diameter 3m. The radar operates at a wavelength of 10cm and transmits peak pulse power of 0.5mW. The receiver can detect a minimum signal power of 10^{-13}W. Find the maximum range at which target can be detected. **(07 Marks)**

   c. Explain briefly, various applications of radar. **(05 Marks)**

OR

2 a. Define the following terms used in radar.
      i) Maximum unambiguous Range ii) Average power iii) Duty cycle iv) PRF. **(08 Marks)**

   b. Derive the simple form of radar rang equation. Deduce the equation to other forms also. **(07 Marks)**

   c. Compute the following related to radar
      i)   What should be the PRF of a radar in order to achieve maximum unambiguous range of 60nmi?
      ii) How long does it take for the radar signal to travel out and back when the target is at the maximum unambiguous range?
      iii) If radar has a peak power of 800kW, what is its average power? Choose pulse width of 1.5 μs **(05 Marks)**

Module-2

3 a. Derive the modified radar range equation in term of SNR. **(08 Marks)**

   b. Discuss with equation, the probability of false alarm and probability of detection using envelope detector. Draw the block diagram. **(07 Marks)**

   c. Write a note on PRF and range ambiguity with necessary waveforms. **(05 Marks)**

OR

4 a. Briefly explain the plumbing loss and antenna losses in radar. **(08 Marks)**

   b. Explain briefly, the following radar cross section of targets, i) Sphere ii) Cone sphere. **(07 Marks)**

   c. The bandwidth of an IF amplifier is 4MHz and the average false – alarm time that could be tolerated is 10min.
      i)   Find the probability of false alarm
      ii) What is the ratio of threshold voltage to the RMS value of the noise
      iii) Voltage necessary to achieve this false alarm time. **(05 Marks)**

Module-3

5 a. Illustrate with a neat block diagram single delay line canceller. Also derive expression for frequency response of single DLC. **(08 Marks)**

b. With a block diagram, explain the working of MTI Radar. (07 Marks)
c. Define Blind speed. MTI order operating at a wavelength of 10cm has a PRF of 1KHz. Calculate the first three blind speeds in KMPH. (05 Marks)

OR

6 a. Starting from the basic principles, derive the equation for clutter attenuation and MTI improvement factor. (08 Marks)
b. With necessary equations and block diagram, explain how simple pulse Doppler radar extracts the Doppler frequency shift of the echo signal from the moving target. Also derive the equation for Doppler shift. (07 Marks)
c. Explain working of moving target detector with block diagram. (05 Marks)

Module-4

7 a. Define a monopulse tracker. Using block diagram, explain amplitude comparison tracking radar in on one coordinate. (08 Marks)
b. What are the different types of tracking radar systems? (06 Marks)
c. Discuss on tracking in range in tracking radar. (06 Marks)

OR

8 a. What do you mean by sequential lobing and conical scanning? Explain with a neat block diagram, conical scanning radar. (08 Marks)
b. Compare monopulse and conical scan tracking radar. (06 Marks)
c. Explain briefly, the phase comparison monopulse. (06 Marks)

Module-5

9 a. Discuss electronically steered phased array antenna with necessary equation for radiation pattern. (08 Marks)
b. What are the functions of radar antenna? (06 Marks)
c. Write a short note on radar displays. (06 Marks)

OR

10 a. What is the role of a duplexer in radar? Explain the working of balanced duplexer with neat diagram. (08 Marks)
b. Explain the following antenna parameters
i) Directive gain   ii) Power gain   iii) Effective Aperture (06 Marks)
c. Write a short note on reflector antenna. (06 Marks)

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