EN702 - Digital and Wireless Communication

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Notes : 1. All questions carry marks as indicated.
     2. Assume suitable data wherever necessary.
     3. Illustrate your answers wherever necessary with the help of neat sketches.
     4. Use of Erlang chart is permitted.

1. a) Draw and explain the cellular telephone system. **8**

  b) A certain city has an area of 1280 sq. miles and is covered by a cellular system using a 7 cell reuse pattern. Each cell has radius of 4 miles and city is allocated 40 MHz of spectrum with full duplex bandwidth of 60 kHz. Assume a grade of service of 2% for Erlang B system is specified. If traffic user is 0.03 Erlangs. Compute the following. **8**
   i) The number of cells in service area.
   ii) The number of channels / cell.
   iii) The maximum carried traffic.
   iv) Traffic intensity of each cell.
   v) Total number of users that can be served for 2% GOS.
   vi) Theoretical maximum number of users that could be served at one time.

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OR

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2. a) Explain the cellular concept with the aid of **8**
   i) Frequency reuse.
   ii) Channel assignment strategies and
   iii) Handoff strategies.

  b) If a 20 MHz of total spectrum is allocated for a duplex wireless cellular system and each simplex channel has 25 kHz RF bandwidth, **8**
   Find
   i) The number of duplex channel.
   ii) The total number of channels per cell site for N = 4, N=7 and N=12.

3. a) Explain salient features of QAM. **8**

  b) Explain BPSK transmitter and receiver. **8**

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4. a) Find the 3dB bandwidth for a Gaussian low pass filter used to produce 0.25 GMSK with a channel data rate of R_b = 270 kbps. What is the 90% power bandwidth in the RF channel? Specify the Gaussian parameter α. **8**

  b) Explain $\pi/4$ QPSK transmission with the help of following. **8**
   i) $\pi/4$ QPSK transmitter and ii) Constellation diagram.

5. a) Write short notes on. **8**
    i) Polarisation diversity.
    ii) Frequency diversity and
    iii) Time diversity.

    b) Explain the importance of space diversity? How space diversity is classified? Explain with example. **8**

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6. a) What is equalisation? Explain any one non-linear equalisation technique. **8**

    b) "Adaptive equalizer is an inverse filter of channel" justify this with the aid of expression Draw the block diagram of simplified communication system using an adaptive equalizer at the receiver end. **8**

7. a) Write features of:- **8**
    i) TDMA   ii) FDMA

    b) What is spread spectrum multiple access? Explain FHMA. **8**

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8. a) What is duplexing? Explain FDD and TOD with suitable example for each. **8**

    b) Write short notes on. **8**
    i) CDMA   ii) SDMA

9. a) Draw the block diagram of GSM system architecture. Explain various interface used in GSM. **8**

    b) If a normal GSM time slot consist of 6 trailing bits, 8.25 guard bits, 26 trailing bits and 2 traffic bursts of 58 bits of data. Find the frame efficiency. **8**

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10. a) Explain GSM features and services in detail. **8**

    b) If GSM uses a frame structure where each frame consists of eight time slots, and each time slot contains 156.25 bit and data is transmitted at 270.833 kbps in the channel. **8**
    Find i) Time duration of a bit.
        ii) Time duration of a slot.
        iii) Time duration of a frame.
        iv) How long must a user occupying a single time slot wait between two successive transmissions?

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