M.C.S. B.E. - Sem - VII (Rev) EXTC - Nov/Dec '05

8 : MK-XP.p65

Con. 5502-05. (REVISED COURSE) (3) PR-7709

(3 Hours) [Total Marks : 100

N.B. (1) Question No. **1** is **compulsory**.
(2) Solve any **four** questions from Question Nos. **2** to **7**.
(3) Draw **neat** sketches, wherever **required**.
(4) Assume **suitable** data wherever **necessary** and **justify** it.
(5) **Figures** to the **right** indicate **full** marks.

1. (a) Define the following terms : 10
   (i) Coherence time
   (ii) Coherence Bandwidth
   (iii) Doppler spread.
   (iv) r.m.s. delay spread
   (v) Maximum excess delay

   (b) Explain the following in short :—
   (i) RACH in GSM has larger guard time. Why ? 2
   (ii) Why hyper frame has been defined in GSM, TDMA frame structure ? 2
   (iii) When do we use FACCH ? How does it gain access to the time slot ? 2
   (iv) Why Interleaving is done in GSM signal processing operations ? 2
   (v) Why power control sub-channel is used in IS-95 ? 2

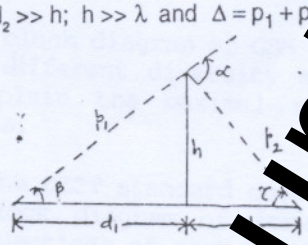
2. (a) Explain the functional model for Digital European Cordless Telephone (DECT) along with its FDMA/TDMA/TDD structure. 10

   (b) Using the kinfe edge geometry, as shown in figure below, show that :-

   (i) $\phi = \frac{2\pi\Delta}{\lambda} = \frac{2\pi}{\lambda}\left[\frac{h^2}{2}\left(\frac{d_1+d_2}{d_1\,d_2}\right)\right]$ 5

   (ii) $v = \alpha\sqrt{\frac{2\,d_1\,d_2}{\lambda\,(d_1+d_2)}}$, where $\frac{v^2\pi}{2}$ 5

   Assume $d_1, d_2 >> h$; $h >> \lambda$ and $\Delta = p_1 + p_2 - (d_1 + d_2)$



3. (a) If the received power at a reference distance d_0 = 1km is equal to 1 microwatt; find the received power at distances of 5 km and 20 km for same transmitter for the following path loss models —
   (i) Free space path loss model 5
   (ii) Two-ray ground reflection model. 5
   Assume f = 1800 MHz, h_t = 40 m, h_r = 3m, $G_t = G_r$ = 0 dB.

   (b) Explain the following with respect to GSM system —
   (i) Authentication Centre 2
   (ii) Home Location Register 2
   (iii) Dedicated Control Channels. 6

4. (a) Explain with a neat block diagram, the Dual mode digital mobile cellular phone. What do you mean by SIM ? What are its functions ? 12

   (b) Explain with suitable block diagram, the modulation process on reverse IS-95 channel. 8

5. (a) A cellular system uses a cluster size of seven. It is operated with 660 channels, 30 of which are designated as setup channels so that there are approximately 90 voice channels available per cell. If there is a potential user density of 9000 users/km² in the system and each user makes an average of one call per hour and each call lasts 1 minute during peak hours, determine the probability that a user will experience a delay greater than 20 seconds if all calls are queued. 10
   [**Given :** R = 0·46655 km, Area covered per cell = 2·598 × R²]

   (b) What are the different diversity scheme used in mobile radio environment ? Hence, explain the maximal ratio combining and equal gain combining techniques. 10

6. (a) List the features of Globalstar mobile satellite system. Hence, explain the Network architecture for Globalstar system. 10

   (b) Describe the various factors influencing the small scale fading. 4

   (c) Explain in short the umbrella cell approach. What do you mean by Cell Dragging ? 6

7. (a) Explain with a neat block diagram the voice modulation process in AMPS system. What is the requirement of SAT tones and signalling tone in AMPS system ? 8

   (b) Write short notes on following (any **three**) :— 12
   (i) Sectorization in cellular system, with special reference to capacity improvement in cellular systems
   (ii) Under-lay and Over-lay arrangement
   Channel borrowing and