

**Electronics and Communication Engineering**  
**Mid-Semester (Autumn) Examination, M. Tech, 2013**

Course Code: EC 615

Course Name: Mobile Communications

Full Marks: 30

Duration of Examination: 2 hours

| Answer all the questions. |  |       |
|---------------------------|--|-------|
| Q.No.                     |  | Marks |
| 1                         | List all 1G, 2G, 2.5G and 3G mobile telephone standards. Compare them based on following parameters:<br><br>i) RF channel BW<br>ii) Peak data rate<br>iii) Maximum number of users<br>iv) Modulation types<br>v) Multiple Access Schemes   | 8     |
| 2 a                       | Derive the expression for S/I ratio in a worst-case scenario of a mobile unit within a cell.   | 3     |
| b                         | Consider a city with total area of $2500 \text{ km}^2$ covered by a hexagonal cell array with a 7-cell reuse pattern. The radius of each cell is 6 km. The cellular system has allocated a total bandwidth of 25 MHz and a full duplex channel bandwidth of 30 KHz. A total of 40 KHz guard band is used as in FDMA systems. There are total 16 control channels. Determine<br><br>a) the number of cells in the service area<br>b) the number of channels without frequency reuse<br>c) the cell capacity | 4     |
| 3 a                       | Define and explain the terms ERP and EIRP.   | 3     |
| b                         | If the received power at a reference distance $d_0 = 1 \text{ km}$ is equal to $1 \mu\text{watt}$ in a large city, find the received power at distances of 2 km. from the same transmitter using the Hata model. The height of transmitting antenna is 40 m, height of receiving antenna is 3 m and the operating frequency is 1800 MHz.   | 4     |
| 4 a                       | Describe the different types of small scale fading.  | 4     |
| b                         | If a particular modulation scheme provides suitable BER performance whenever $\sigma_r / T_s \leq 0.1$ determine the maximum symbol rate that may be sent through RF channels shown in Fig.1 without using an equalizer.   | 4     |



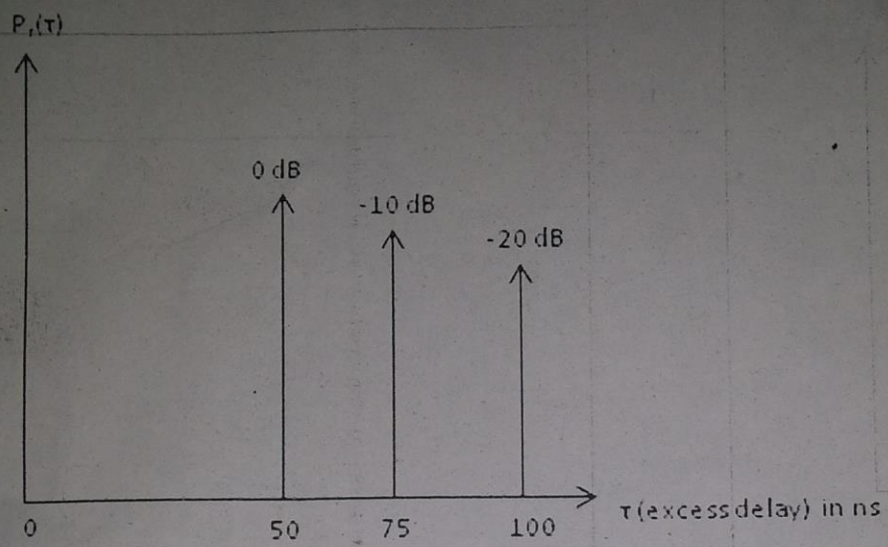


Fig.1 Channel response