

Registration No. :

--	--	--	--	--	--	--	--	--	--

Total number of printed pages – 3

B. Tech  
**PEEC 5302**

**Sixth Semester Regular Examination – 2015**

**MOBILE COMMUNICATION**

**BRANCH (S) : EC, ETC**

**QUESTION CODE : J 492**

**Full Marks – 70**

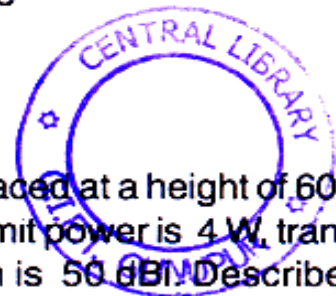
**Time : 3 Hours**



*Answer Question No. 1 which is compulsory and any five from the rest.  
The figures in the right-hand margin indicate marks.*

1. Answer the following questions : 2×10
- (a) What is the role of GPRS in enhancing 2G GSM system ?
  - (b) What is shadow effect? What type of distribution is used to represent the shadow effect ?
  - (c) Define coherence time. How can be the channel characterize with respect to coherence time.
  - (d) What is the significant of reuse factor in cellular mobile communication? What should be the reuse factor for a mobile communication system in which an S/I of 20 dB is required ? Explain briefly about the types of interferences observed in mobile communication.
  - (e) The total coverage area of a cellular system is  $262.4 \text{ km}^2$  and cell radius is 1km. What is the system capacity for  $N=4$  if there are total 1000 duplex channels ?
  - (f) Define spectral efficiency. What is the spectral efficiency of a mobile phone system where there are 395 channels of 30 kHz each in a bandwidth of 12.5 MHz ?
  - (g) What are the requirements for a Direct Sequence Spread Spectrum ?
  - (h) Explain the role(s) of frequency synthesizer in frequency hopping spread spectrum.
  - (i) Write down the property of MSK.
  - (j) What is the role of GPRS in enhancing 2G GSM system ?

**P.T.O.**



2. (a) A station transmits a power of 10 W into a feeder cable with a cable loss of 10 dB. The transmit antenna has a gain of 12 dBi in the direction of the mobile receiver with a gain of 0 dBi and feeder loss of 2 dB. The mobile receiver has a sensitivity of  $-104$  dBm. Determine
- (i) the effective isotropic radiated power, and
  - (ii) maximum acceptable path loss. 6
- (b) In a synchronous satellite system the satellite is placed at a height of 60,000 km from the terrestrial antenna. The satellite transmit power is 4 W, transmit antenna gain is 18 dBi and receive antenna gain is 50 dBi. Describe the path-loss model that can be used to represent the system. What is the received power for the link? 4
3. (a) Prove that for a hexagonal cell geometry the cluster size  $N = i^2 + j^2 + ij$ . 6
- (b) What is co-channel interference? Find out the expression for signal to co-channel interference ratio (S/I) from the first tier co-channel cells in a hexagonal cell structure. 4
4. (a) What is cell sectoring? How does cell sectoring help in reduction of co-channel interference? 4
- (b) Describe the objective(s) of cell splitting. How is 4:1 cell splitting achieved? How does the cell splitting help in the reduction in transmit power? 6
5. (a) A suburb has an area of 1500 sq. miles and is covered by a cellular system that uses a seven cell re-use pattern. Each cell has a radius of four miles and the city is allocated 50 MHz spectrum of a full duplex channel BW of 60 kHz. Assuming a GOS 2%. The traffic load per user is 0.03E. Calculate (i) the number of cells in the service area, (ii) the number of channels per cell, (iii) the maximum carried traffic, (iv) number of mobiles per channel. [For 119 channels with 2% blocking the offered traffic is 106.4E] 6
- (b) Define capacity of a mobile system. Find out the capacity of a DS-CDMA system. 4
6. (a) Explain the concept of frequency hopping spread spectrum. 5
- (b) The input data rate in an FHSS system is 200 kbps. The frequency hopping rate is 200 hops per second. 32-ary FSK modulation scheme is used to modulate the symbols. Calculate (i) minimum separation between frequency tones, (ii) number of frequency tones produced by a frequency synthesizer, (iii) processing gain, and (iv) hopping bandwidth. Given also  $K = 1.5$

7. (a) Explain the  $\pi/4$ -DQPSK modulation scheme. The bit stream is 001001110100111010010100 and the transmitted signal is  $A\cos(\omega t + \phi_k)$ . Calculate  $\phi_k$  for the  $\pi/4$ -DQPSK modulation method. 6
- (b) Represent equation of a MSK modulated signal. The channel bandwidth and data rate of a system using GMSK modulation scheme are 200 kHz and a data rate of 270.8 kbps respectively. Calculate (i) the frequency shift between binary 1 and binary 0, (ii) the transmitted frequencies if the carrier frequency is 900 MHz, and (iii) the bandwidth efficiency in bps/Hz. 4
8. Write short notes on any **two** : 5 × 2
- (a) Segmentation of cell
  - (b) Direct sequence spread spectrum system
  - (c) Comparison between TDMA, FDMA and CDMA
  - (d) Equalization.

