

**B.Tech. – VIEP – ELECTRONICS AND
COMMUNICATION ENGINEERING
(BTECVI)**

00588 **Term-End Examination
December, 2014**

BIEL-018 : WIRELESS COMMUNICATION

Time : 3 hours

Maximum Marks : 70

Note : Attempt any **seven** questions out of the ten questions. All questions carry equal marks. Missing data may be suitably assumed.

1. (a) Assume a receiver is located 10 km from a 50 W transmitter. The carrier frequency is 900 MHz, free space propagation is assumed, $G_t = 1$ and $G_r = 2$.

Find

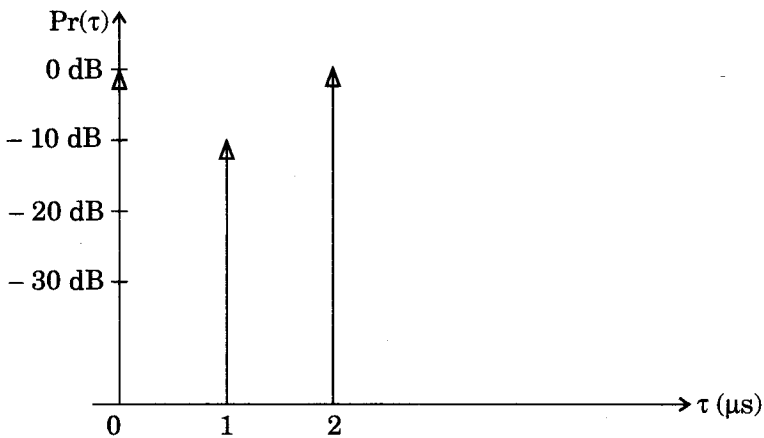
- (i) the power at the receiver,
- (ii) the magnitude of the E-field at the receiver antenna,
- (iii) the r.m.s. voltage applied to the receiver input.

Assume that the receiver antenna has a purely real impedance of 50Ω and is perfectly matched to the receiver. 5

- (b) Discuss the impulse response model of a multipath channel. 5

2. (a) Define and explain rms delay spread and coherence bandwidth, doppler spread and coherence time. 5

(b) A local spatial average of a power delay profile measured at 900 MHz is shown below : 5



- (i) Determine the rms delay spread and mean excess delay for the channel.
- (ii) If a mobile travelling at 30 km/hr receives a signal through the channel, determine the time over which the channel appears stationary (or at least highly correlated).

3. (a) Explain the following terms with reference to FHSS :
- (i) Instantaneous bandwidth
 - (ii) Hopping bandwidth 5
- (b) In IS-95 CDMA, assume $K = 20$ users share the same 1.25 MHz channel. The chip rate for each user is 1.2288 Mcps and each user has a baseband data rate of 13 kbps. If a maximum E_b/N_0 of 7.8 dB is provided for each user and the PN code lengths are 32678 chips, find the bit error probability for a user in terms of Q function. 5
4. (a) Prove that the equalizer is an inverse filter of channel. 5
- (b) Why is the frequency diversity technique used in wireless communication ? 5
5. (a) Discuss the different characteristics of speech signals. 5
- (b) Explain the technique of vector quantisation. 5
6. (a) The US Digital Cellular TDMA system uses a 78.6 kbps data rate to support three users per frame. Each user occupies two of the six time slots per frame. What is the raw data rate provided for each user ? 2
- (b) What are the applications of CDMA technique ? How does CDMA technique work in wireless communication ? 8

7. (a) Explain the dynamic channel assignment scheme. 5
- (b) Why is the umbrella cell approach used in cellular system design ? 5
8. (a) What is cochannel interference ? How can it be minimized ? 5
- (b) A cellular service provider decides to use a digital TDMA scheme, which can tolerate a signal to interference ratio of 15 dB in the worst case. Find the optimal value of N for (i) Omnidirectional antennas (ii) 120° sectoring and (iii) 60° sectoring. Should sectoring be used ? If so, which case (60° or 120°) should be used ? (Assume a path loss exponent of $n = 4$ and consider trunking efficiency). 5
9. (a) What are the channel assignment strategies used in cellular systems ? 5
- (b) How can coverage and capacity of cellular systems be improved ? 5
10. Write short notes on following : $2 \times 5 = 10$
- (a) Wi-Fi
- (b) W-CDMA
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