Name: **Number:**

1) If the wireless link is operated 2400MHz and both side antennas are the same with G=5dBi antenna gains in free-space. What is the maximum received power level [dBm] when distance is 400m and transmitted power is equal to 1W.

   Write your answer with unit

   $-52.24\ 5$

2) If the channel filter parameter r=0.4 and BER is required 1E-6 what is the minimum SNR ratio [dB] for QPSK modulation?

   Write your answer with unit

   $12.54\ dB$

Eb/No [dB]	BPSK	QPSK	8PSK
5	5.95E-03	5.95E-03	3.19E-02
6	2.39E-03	2.39E-03	2.05E-02
7	7.73E-04	7.73E-04	1.20E-02
8	1.91E-04	1.91E-04	6.18E-03
9	3.36E-05	3.36E-05	2.75E-03
10	3.87E-06	3.87E-06	1.01E-03
11	2.61E-07	2.61E-07	2.94E-04
12	9.01E-09	9.01E-09	6.34E-05
13	1.33E-10	1.33E-10	9.42E-06
14	6.81E-13	6.81E-13	8.76E-07
15	9.12E-16	9.12E-16	4.52E-08

3) If your SNR is equal to 12dBi and your bandwidth is 10MHz and BER=3.87E-6. Which amount of data rate carried BPSK and QPSK modulations?

   QPSK   BPSK

   Write your two answers with unit

   $15, 85$

   What is the channel filter parameter r for QPSK?

   0.261

4) If the cable unit length loss is 0.6dB/100m for cable data link and transmit powers are 0.2W and 0.7W. What are the received side power levels of link?

   Write your answer with unit

5) If the message bits are m=11001011 and generator g=100111, determine the transmitted bit stream b (one and zeros form, not use any character between)

   Write your answer with unit

Name: **Number:**

6) The original message was first organized 7 bits rows and even party bit added each row. Then column even parity added to last row. The below is the nine bytes that the receiver collect. Find the error bits and highlight?

   01100101 10110100 00011000 01000111 01000010 10101001 11011000 11001010 01110111

7) What is the maximum bitrate Rb [Mbps] of 8MHz bandwidth channel (ideal filter case r=0) when BER <1E-7 for 8PSK?

   Write your answer with unit

   48 Mbps

8) A wired communication link uses maximum Pt=1500 mW transmit power and cable loss is equal to L=1.2 dB/100m. If communication link is d=450 m long, what is the maximum received power as mW?

   Write your answer with unit

9) Channel capacity in additive white Gaussian channel (AWGN) is given by $C = B \log_2(1 + S/N)$. The bandwidth $B=5$ MHz and noise power spectral density (PSD) $N_o/2 = 0.25 x 10^{-10}$ W/Hz are given. The transmit power is equal to 1W for the wireless channel with isotropic antennas and a carrier frequency 3GHz. The distance between transmitting and receiving antennas is equal to 50 m.

   a) Find the received signal power S.

   b) Calculate the channel capacity.

10) The bit rate-distance product of graded index fiber optic link is given as $BL < 8c /(n_1 \Delta^2)$. If $n_1=1.5$ and $\Delta=0.005$, what is the maximum bitrate for 5km link? (c is the speed of light)

   Write your answer with unit