Started on	Thursday, 18 November 2021, 8:00 PM
State	Finished
Completed on	Thursday, 18 November 2021, 11:34 PM
Time taken	3 hours 34 mins
Grade	**27.00** out of 30.00 (**90**%)

Question **1**

Correct

Mark 3.00 out of 3.00

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.

01100101 10110100 00011000 01000111 01000010 10101001 11011000 11001010 01110111

Decode the message data and find the characters by using ascii table.

Answer: ehb456e ✔

The correct answer is: ehb456e

Question **2**

Correct

Mark 3.00 out of 3.00

A wireless communication link use maximum Pt=1000 mW transmit power and equal antennas on both side with gain G=1 dB.

If communication link is d=400 m long, and frequency is f=600 MHz what is the maximum received power as mW?

Use "." (dot) for decimal, Tolerance ±0.1 relative..

Answer: 0.0000156 ✔

$$\frac{P_t}{P_r} = \frac{(4\pi d)^2}{\lambda^2} = \frac{|4\pi f d|^2}{c^2}$$

The correct answer is: 0.00

$$\frac{1000\ mV}{P_r} = 335103.216 \times \frac{10^{12}}{10^{16}}$$

$$10\log x = 1dB$$

Question **3**

Correct

Mark 3.00 out of 3.00

If computer B is connected to computer A and C by two point-to-point links, then it is possible to send messages from A to C by sending them first from A to B, then from B to C. This is called store-and-forward transmission. A store-and-forward transmission from A to C via B is more efficient if the transmission from B to C can start before that from A to B is completed. Use this concept to answer the following questions:

Suppose 950s message is decomposed into small packets 5s each transmitted on direct link.

How long times [s] that long message transmitted from A to C ?

Use "." dot for decimal separator, Tolerance ± 1 Nominal

Answer: 955

The correct answer is: 955.00

Question **4**

Correct

Mark 3.00 out of 3.00

Eb/No [dB]	BPSK	QPSK	8PSK	16PSK	32PSK	64PSK
5	5.95E-03	5.95E-03	3.19E-02	8.29E-02	1.37E-01	1.89E-01
6	2.39E-03	2.39E-03	2.05E-02	6.82E-02	1.21E-01	1.75E-01
7	7.73E-04	7.73E-04	1.20E-02	5.43E-02	1.06E-01	1.60E-01
8	1.91E-04	1.91E-04	6.18E-03	4.15E-02	9.15E-02	1.45E-01
9	3.36E-05	3.36E-05	2.75E-03	3.00E-02	7.84E-02	1.31E-01
10	3.87E-06	3.87E-06	1.01E-03	2.02E-02	6.61E-02	1.16E-01
11	2.61E-07	2.61E-07	2.94E-04	1.26E-02	5.45E-02	1.03E-01
12	9.01E-09	9.01E-09	6.34E-05	7.01E-03	4.35E-02	9.03E-02
13	1.33E-10	1.33E-10	9.42E-06	3.43E-03	3.32E-02	7.85E-02
14	6.81E-13	6.81E-13	8.76E-07	1.42E-03	2.41E-02	6.75E-02
15	9.12E-16	9.12E-16	4.52E-08	4.79E-04	1.63E-02	5.72E-02
16	2.27E-19	2.27E-19	1.11E-09	1.25E-04	1.01E-02	4.75E-02
17	6.76E-24	6.76E-24	1.07E-11	2.34E-05	5.64E-03	3.82E-02
18	1.40E-29	1.40E-29	3.21E-14	2.93E-06	2.76E-03	2.95E-02
19	1.00E-36	1.00E-36	2.19E-17	2.19E-07	1.15E-03	2.16E-02
20	0.00E+00	0.00E+00	2.33E-21	8.57E-09	3.88E-04	1.49E-02
21	0.00E+00	0.00E+00	2.39E-26	1.49E-10	1.01E-04	9.42E-03
22	0.00E+00	0.00E+00	1.29E-32	9.35E-13	1.91E-05	5.39E-03
23	0.00E+00	0.00E+00	0.00E+00	1.62E-15	2.39E-06	2.73E-03
24	0.00E+00	0.00E+00	0.00E+00	5.55E-19	1.80E-07	1.18E-03
25	0.00E+00	0.00E+00	0.00E+00	2.49E-23	7.10E-09	4.18E-04
26	0.00E+00	0.00E+00	0.00E+00	8.57E-29	1.25E-10	1.16E-04
27	0.00E+00	0.00E+00	0.00E+00	1.17E-35	7.89E-13	2.36E-05
28	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.39E-15	3.26E-06
29	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.84E-19	2.77E-07
30	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.21E-23	1.28E-08
31	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.84E-29	2.72E-10
32	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.11E-35	2.19E-12
33	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.23E-15
34	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.68E-18
35	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.99E-22

BER performance of the MPSK modulation is given in table.

If the channel filter parameter r=0.5 and BER is required 1E-6 what is the minimum SNR ratio [dB] for 32PSK modulation?

Use integer Eb/No and do not interpolate.

Tolerance ±1 nominal

Answer: 29.229

The correct answer is: 29.23

$\frac{R_b}{B} = \frac{\log_2 M}{1+\alpha}$

25.18×3.33

Question **5**

Correct

Mark 3.00 out of 3.00

Below table shows the PSK modulation BER performance versus Eb/No [dB].

Eb/No [dB]	BPSK	QPSK	8PSK	16PSK	32PSK	64PSK
5	5.95E-03	5.95E-03	3.19E-02	8.29E-02	1.37E-01	1.89E-01
6	2.39E-03	2.39E-03	2.05E-02	6.82E-02	1.21E-01	1.75E-01
7	7.73E-04	7.73E-04	1.20E-02	5.43E-02	1.06E-01	1.60E-01
8	1.91E-04	1.91E-04	6.18E-03	4.15E-02	9.15E-02	1.45E-01
9	3.36E-05	3.36E-05	2.75E-03	3.00E-02	7.84E-02	1.31E-01
10	3.87E-06	3.87E-06	1.01E-03	2.02E-02	6.61E-02	1.16E-01
11	2.61E-07	2.61E-07	2.94E-04	1.26E-02	5.45E-02	1.03E-01
12	9.01E-09	9.01E-09	6.34E-05	7.01E-03	4.35E-02	9.03E-02
13	1.33E-10	1.33E-10	9.42E-06	3.43E-03	3.32E-02	7.85E-02
14	6.81E-13	6.81E-13	8.76E-07	1.42E-03	2.41E-02	6.75E-02
15	9.12E-16	9.12E-16	4.52E-08	4.79E-04	1.63E-02	5.72E-02
16	2.27E-19	2.27E-19	1.11E-09	1.25E-04	1.01E-02	4.75E-02
17	6.76E-24	6.76E-24	1.07E-11	2.34E-05	5.64E-03	3.82E-02
18	1.40E-29	1.40E-29	3.21E-14	2.93E-06	2.76E-03	2.95E-02
19	1.00E-36	1.00E-36	2.19E-17	2.19E-07	1.15E-03	2.16E-02
20	0.00E+00	0.00E+00	2.33E-21	8.57E-09	3.88E-04	1.49E-02
21	0.00E+00	0.00E+00	2.39E-26	1.49E-10	1.01E-04	9.42E-03
22	0.00E+00	0.00E+00	1.29E-32	9.35E-13	1.91E-05	5.39E-03
23	0.00E+00	0.00E+00	0.00E+00	1.62E-15	2.39E-06	2.73E-03
24	0.00E+00	0.00E+00	0.00E+00	5.55E-19	1.80E-07	1.18E-03
25	0.00E+00	0.00E+00	0.00E+00	2.49E-23	7.10E-09	4.18E-04
26	0.00E+00	0.00E+00	0.00E+00	8.57E-29	1.25E-10	1.16E-04
27	0.00E+00	0.00E+00	0.00E+00	1.17E-35	7.89E-13	2.36E-05
28	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.39E-15	3.26E-06
29	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.84E-19	2.77E-07
30	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.21E-23	1.28E-08
31	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.84E-29	2.72E-10
32	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.11E-35	2.19E-12
33	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.23E-15
34	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.68E-18
35	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.99E-22

What is the minimum required SNR [dB] of 8MHz bandwidth channel (ideal filter case r=0) when BER <1E-6 for 8PSK?

Use only integer Eb/No values !! (not interpolate table)

Use "." dot for decimal separator, Tolerance ± 1 Nominal

Answer: 18.77

The correct answer is: 18.77

$25,118 \cdot 3$

$\frac{E_b}{N} \cdot \frac{R_b}{B} = \frac{S}{N} \Rightarrow 25,118 \times 3 = X$

$\left(\frac{S}{N}\right)_d = 10\log_{10} X$

Question **6**

Correct

Mark 3.00 out of 3.00

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

Answer: 1100101100001 ✔

The correct answer is: 1100101100001

Question **7**

Correct

Mark 3.00 out of 3.00

If the wireless link is operated 1700MHz and both side antennas are the same with G=3dBi gains in free-space. What is the maximum received power level [dBm] when distance is 500m and transmitted power is equal to 1W.

Tolerance ±1 Nominal and use dot "." for decimal

Answer: -55.04 ✔

The correct answer is: -54.99

Question 8

Incorrect

Mark 0.00 out of 3.00

Below table shows the PSK modulation BER performance versus Eb/No [dB].

Eb/No [dB]	BPSK	QPSK	8PSK	16PSK	32PSK	64PSK
5	5.95E-03	5.95E-03	3.19E-02	8.29E-02	1.37E-01	1.89E-01
6	2.39E-03	2.39E-03	2.05E-02	6.82E-02	1.21E-01	1.75E-01
7	7.73E-04	7.73E-04	1.20E-02	5.43E-02	1.06E-01	1.60E-01
8	1.91E-04	1.91E-04	6.18E-03	4.15E-02	9.15E-02	1.45E-01
9	3.36E-05	3.36E-05	2.75E-03	3.00E-02	7.84E-02	1.31E-01
10	3.87E-06	3.87E-06	1.01E-03	2.02E-02	6.61E-02	1.16E-01
11	2.61E-07	2.61E-07	2.94E-04	1.26E-02	5.45E-02	1.03E-01
12	9.01E-09	9.01E-09	6.34E-05	7.01E-03	4.35E-02	9.03E-02
13	1.33E-10	1.33E-10	9.42E-06	3.43E-03	3.32E-02	7.85E-02
14	6.81E-13	6.81E-13	8.76E-07	1.42E-03	2.41E-02	6.75E-02
15	9.12E-16	9.12E-16	4.52E-08	4.79E-04	1.63E-02	5.72E-02
16	2.27E-19	2.27E-19	1.11E-09	1.25E-04	1.01E-02	4.75E-02
17	6.76E-24	6.76E-24	1.07E-11	2.34E-05	5.64E-03	3.82E-02
18	1.40E-29	1.40E-29	3.21E-14	2.93E-06	2.76E-03	2.95E-02
19	1.00E-36	1.00E-36	2.19E-17	2.19E-07	1.15E-03	2.16E-02
20	0.00E+00	0.00E+00	2.33E-21	8.57E-09	3.88E-04	1.49E-02
21	0.00E+00	0.00E+00	2.39E-26	1.49E-10	1.01E-04	9.42E-03
22	0.00E+00	0.00E+00	1.29E-32	9.35E-13	1.91E-05	5.39E-03
23	0.00E+00	0.00E+00	0.00E+00	1.62E-15	2.39E-06	2.73E-03
24	0.00E+00	0.00E+00	0.00E+00	5.55E-19	1.80E-07	1.18E-03
25	0.00E+00	0.00E+00	0.00E+00	2.49E-23	7.10E-09	4.18E-04
26	0.00E+00	0.00E+00	0.00E+00	8.57E-29	1.25E-10	1.16E-04
27	0.00E+00	0.00E+00	0.00E+00	1.17E-35	7.89E-13	2.36E-05
28	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.39E-15	3.26E-06
29	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.84E-19	2.77E-07
30	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.21E-23	1.28E-08
31	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.84E-29	2.72E-10
32	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.11E-35	2.19E-12
33	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.23E-15
34	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.68E-18
35	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.99E-22

What is the maximum bitrate Rb [Mbps] of 2MHz bandwidth channel (ideal filter case r=0) when BER <1E-6 for 8PSK?

Use only integer Eb/No values !! (not interpolate table)

Use "." dot for decimal separator, Tolerance ± 0.1 Nominal

Answer: 12.5 ✖

The correct answer is: 6.00

$$\frac{R_b}{B} = \frac{\log_2 M}{1+\alpha}, \quad \alpha = 0 \Rightarrow R_b = B \cdot \log_2 M$$

$$= 2 \times \log_2 8$$

$$= 6$$

Question **9**

Correct

Mark 3.00 out of 3.00

A wired communication link use maximum Pt=1500 mW transmit power and cable loss is equal to L=2 dB/100m.

If communication link is d=250 m long, what is the maximum received power as mW?

Use "." (dot) for decimal, Tolerance ±0.1 relative..

Answer: 474.34165 ✔

$10\log_{10} 1500 = 31,76$, d.L = 5dB

$31,76 - 5 = 26,76dB$

$10\log_{10} X = 26,76dB \Rightarrow X = 474,34\,mW$

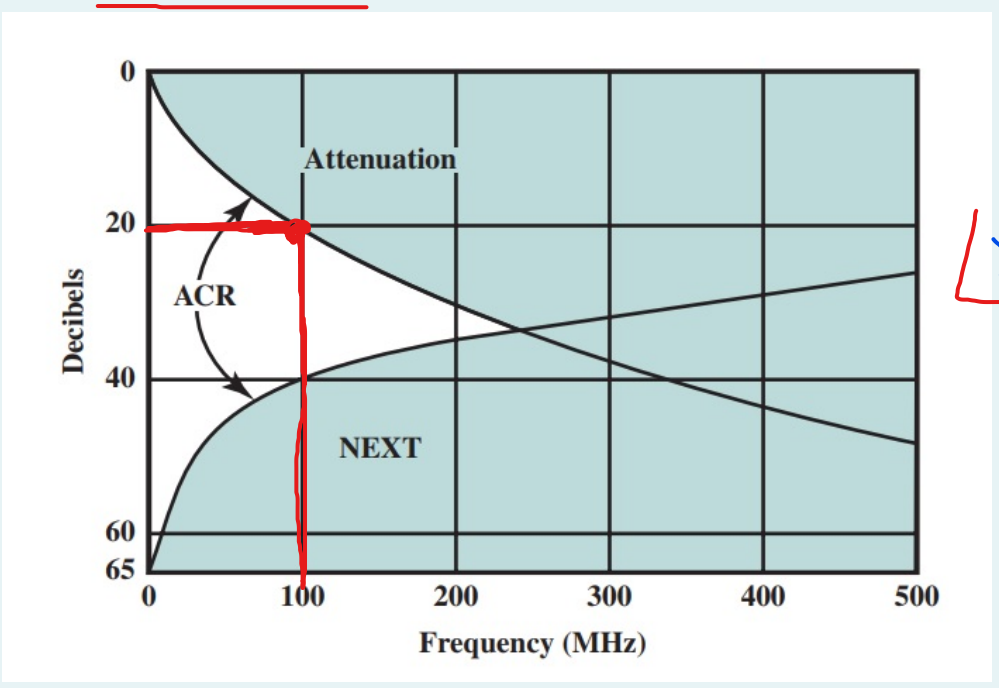
The correct answer is: 474.34

Question **10**

Correct

Mark 3.00 out of 3.00

If the cable unit length loss is 0.7dB/100m for symmetrical cable data link which will use 100MHz frequency.



$0,7^{dB}$ 100m

20^{dB} x m

$X = 2857,14m$

What is the maximum cable link length [m] ?

Tolerance ±5m nominal and use "." dot for decimal separator.

Answer: 2857.14 ✔

The correct answer is: 2857.14

◂ Qt

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