



**Faculty of Engineering & Technology
Electrical & Computer Engineering Department**

WIRELESS AND MOBILE NETWORKS – ENCS5323

Project Report

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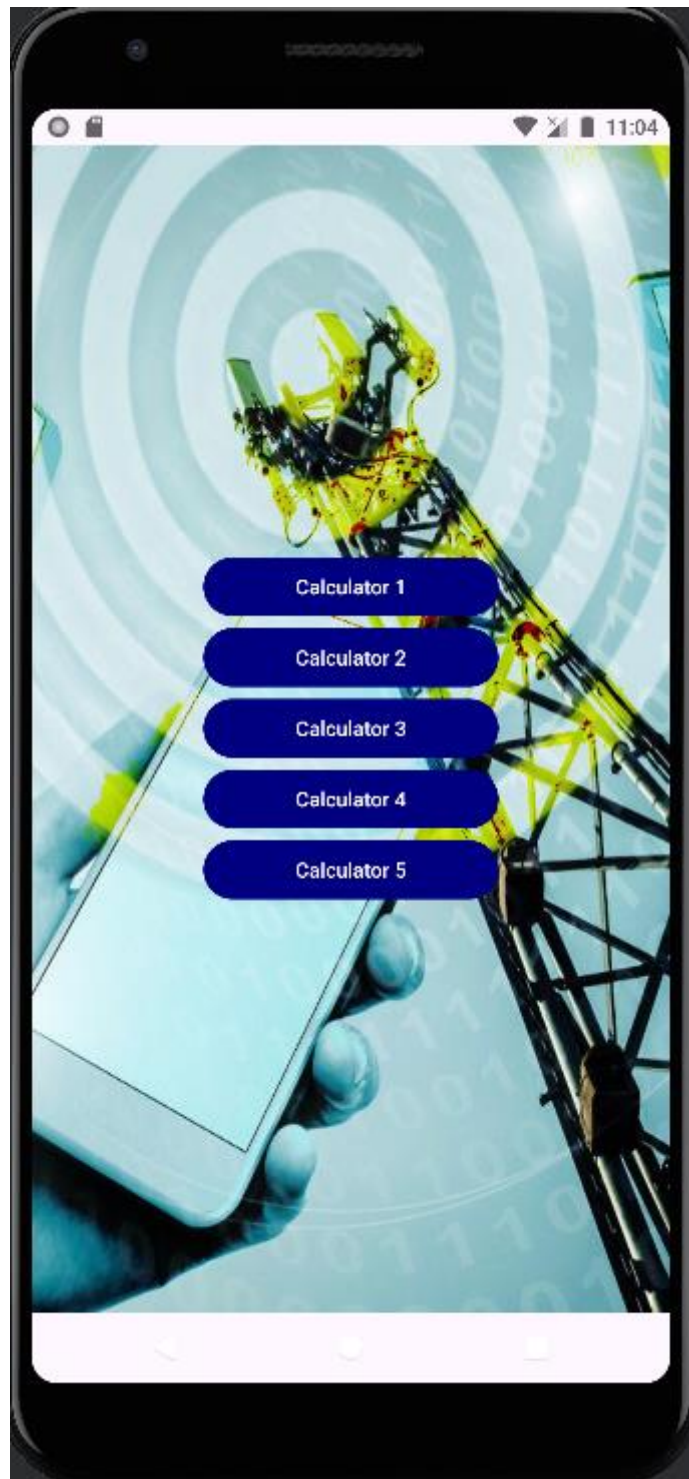
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Main Page



First Calculator

Validation

Digital Communication System Design and Analysis.

Bandwidth (kHz):

Number of bits for quantizer:

Source encoder rate:

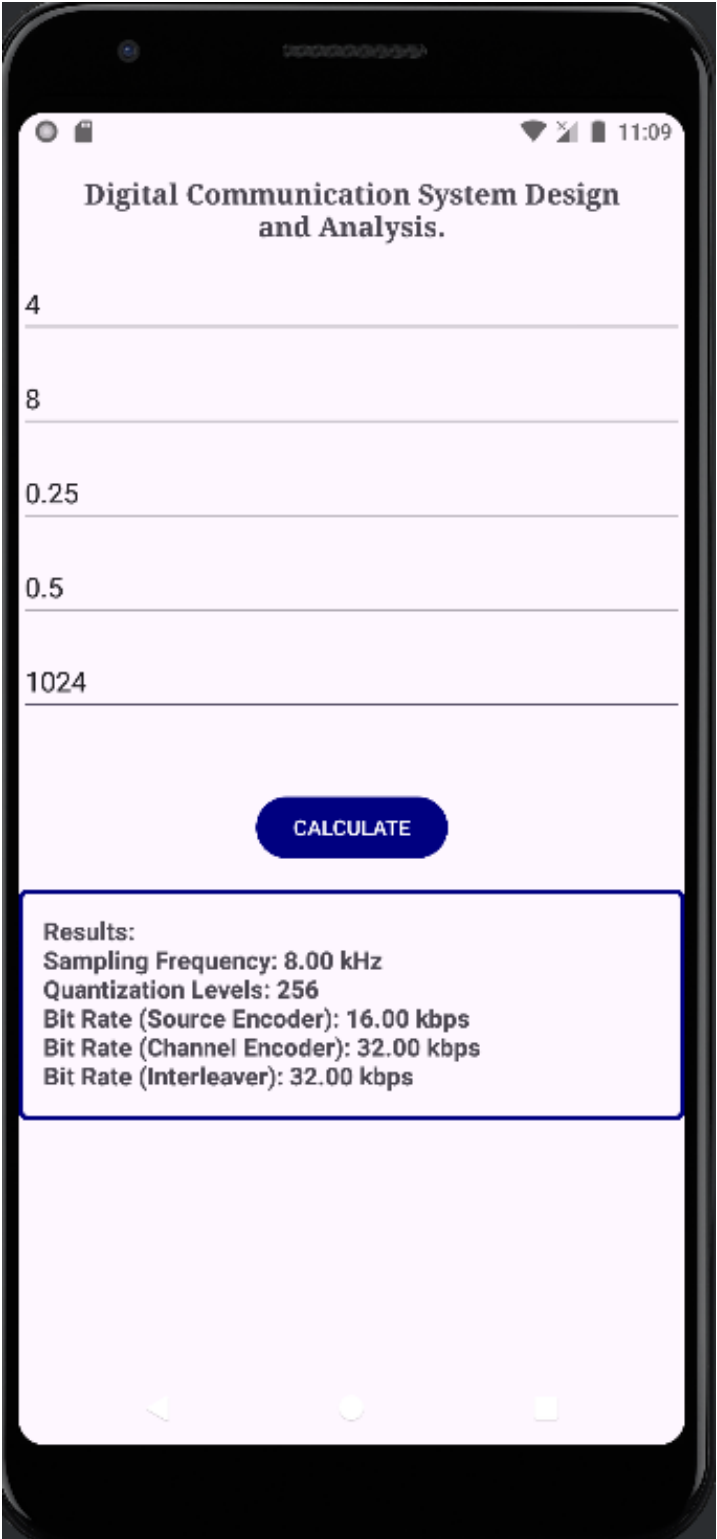
Channel encoder rate:

Number of bits for interleaver:

CALCULATE

Please enter valid numbers

Scenario 1: Typical Test Case



The screenshot shows a mobile application interface with a light purple background. At the top, the title "Digital Communication System Design and Analysis." is centered. Below the title are five input fields with the values 4, 8, 0.25, 0.5, and 1024. A blue "CALCULATE" button is positioned below the input fields. At the bottom, a white box with a blue border contains the results of the calculation.

Digital Communication System Design and Analysis.

4

8

0.25

0.5

1024

CALCULATE

Results:
Sampling Frequency: 8.00 kHz
Quantization Levels: 256
Bit Rate (Source Encoder): 16.00 kbps
Bit Rate (Channel Encoder): 32.00 kbps
Bit Rate (Interleaver): 32.00 kbps

Scenario 2: Boundary Values and Zero Input Test Case

The screenshot shows a mobile application interface with a light purple background. At the top, the title "Digital Communication System Design and Analysis." is displayed. Below the title, there are five input fields with the values "0", "1", ".1", ".1", and "1" entered. A blue "CALCULATE" button is positioned below the input fields. At the bottom, a white box with a blue border contains the results of the calculation.

Digital Communication System Design and Analysis.

0

1

.1

.1

1

CALCULATE

Results:
Sampling Frequency: 0.00 kHz
Quantization Levels: 2
Bit Rate (Source Encoder): 0.00 kbps
Bit Rate (Channel Encoder): 0.00 kbps
Bit Rate (Interleaver): 0.00 kbps

Scenario 3: Boundary Values and Zero Input Test Case

The screenshot shows a mobile application interface with a light purple background. At the top, the title "Digital Communication System Design and Analysis." is displayed in a bold, black font. Below the title, there are four input fields. The first field contains the value "200", the second contains "2", the third is empty, and the fourth contains "6400000". Below these fields is a blue button with the text "CALCULATE" in white. At the bottom of the screen, there is a section titled "Results:" which lists the following values: "Sampling Frequency: 200.00 kHz", "Quantization Levels: 2147483647", "Bit Rate (Source Encoder): 6400.00 kbps", "Bit Rate (Channel Encoder): 64000.00 kbps", and "Bit Rate (Interleaver): 64000.00 kbps". The status bar at the top of the phone shows the time as 11:24 and various icons for signal, battery, and connectivity.

00

2

000000

CALCULATE

Results:
Sampling Frequency: 200.00 kHz
Quantization Levels: 2147483647
Bit Rate (Source Encoder): 6400.00 kbps
Bit Rate (Channel Encoder): 64000.00 kbps
Bit Rate (Interleaver): 64000.00 kbps

Second Calculator

Validation

Resource Elements and OFDM Symbols

Bandwidth (kHz):

Subcarrier Spacing (kHz):

Number of OFDM Symbols:

Duration of the Resource Block (ms):

Number of QAM Bits:

Number of Parallel Resource Blocks:

CALCULATE

Please enter valid numbers

Scenario 1: Typical Test Case

The screenshot shows a mobile application interface with a light purple background. At the top, there's a status bar with icons for signal, Wi-Fi, and battery, and the time 3:52. Below the status bar, the title "Resource Elements and OFDM Symbols" is displayed. The main input area consists of seven horizontal lines, each with a number on the left: 180, 15, 7, .5, 1024, and 4. Below these inputs is a blue button labeled "CALCULATE". At the bottom, there's a white box with a blue border containing the results of the calculation.

Resource Elements and OFDM Symbols

180

15

7

.5

1024

4

CALCULATE

Results:
Bits per Resource Element: 10
Bits per OFDM Symbol: 120
Bits per Resource Block: 840
Max Transmission Rate: 6720.00 kbps

Scenario 2: Min Boundary Values Test Case

The screenshot shows a mobile application interface with a light purple background. At the top, the status bar displays the time 12:49 and various icons. The title "Resource Elements and OFDM Symbols" is centered. Below the title, there are five input fields. The first field contains "0", the second ".015", the third "1", the fourth "0.011", and the fifth "1". A blue "CALCULATE" button is positioned below the input fields. At the bottom, a white box with a blue border contains the results of the calculation.

Resource Elements and OFDM Symbols

0

.015

1

0.011

1

1

CALCULATE

Results:
Bits per Resource Element: 0
Bits per OFDM Symbol: 0
Bits per Resource Block: 0
Max Transmission Rate: 0.00 kbps

Scenario 3: Max Boundary Values Test Case

The screenshot shows a mobile application interface with a light purple background. At the top, the status bar displays the time 11:42 and various icons. The main title is "Resource Elements and OFDM Symbols". Below the title, there are six input fields with the following values: 1000, 30, 1000, 1000, 64, and 1000. A blue "CALCULATE" button is positioned below the input fields. Below the button, a white box with a blue border contains the results of the calculation.

Resource Elements and OFDM Symbols

1000

30

1000

1000

64

1000

CALCULATE

Results:
Bits per Resource Element: 6
Bits per OFDM Symbol: 198
Bits per Resource Block: 198000
Max Transmission Rate: 198000.00 kbps

Third Calculator

Validation

Power Transmitted Calculator

Enter Path Loss: db ▾

Enter Frequency (Hz): db ▾

Enter Transmit Antenna Gain: db ▾

Enter Receive Antenna Gain: db ▾

Enter Data Rate (bps): db ▾

Enter Antenna Feed Line Loss: db ▾

Enter Other Losses: db ▾

Enter Feed Margin: db ▾

Enter Receiver Amplifier Gain: db ▾

Enter Noise Figure Total: db ▾

Enter Noise Temp (Kelvin): db ▾

Enter Link Margin: db ▾

Enter Transmitter Amplifier Gain: db ▾

Enter BER (dB):

Choose The Modulation Type BPSK/QPSK ▾

CALCULATE

Please enter BER value

Scenario 1: 8-PSK & Combining dBs with Unitless Values Test Case

The screenshot shows a mobile application interface for a "Power Transmitted Calculator". The app is running on a device with a status bar at the top showing the time as 2:18. The interface consists of 13 input fields, each with a numerical value and a unit dropdown menu. The values and units are: 140 db, 900000000 unit., 8 db, 0 db, 9600 unit., 12 db, 20 db, 8 db, 24 db, 6 db, 290 unit., 8 db, and 1 unit.. Below these fields is a dropdown menu labeled "Choose The Modulation Type" with "8PSK" selected. A blue "CALCULATE" button is positioned below the modulation type dropdown. At the bottom, a results box displays the calculated values: "Power Transmitted in dB: 9.85 dB", "Power Transmitted in dBm: 39.85 dBm", and "Power Transmitted (unitless): 9.65".

| Input Value | Unit |
|-------------|--------|
| 140 | db |
| 900000000 | unit.. |
| 8 | db |
| 0 | db |
| 9600 | unit.. |
| 12 | db |
| 20 | db |
| 8 | db |
| 24 | db |
| 6 | db |
| 290 | unit.. |
| 8 | db |
| 1 | unit.. |

Choose The Modulation Type: 8PSK

CALCULATE

Power Transmitted in dB: 9.85 dB
Power Transmitted in dBm: 39.85 dBm
Power Transmitted (unitless): 9.65

Scenario 2: 16-PSK & All Values In dBs Test Case

Power Transmitted Calculator

| | | |
|-----|----|---|
| 150 | db | ▼ |
| 190 | db | ▼ |
| 7 | db | ▼ |
| 1 | db | ▼ |
| 43 | db | ▼ |
| 15 | db | ▼ |
| 22 | db | ▼ |
| 9 | db | ▼ |
| 20 | db | ▼ |
| 8 | db | ▼ |
| 25 | db | ▼ |
| 10 | db | ▼ |
| 2 | db | ▼ |

0.0001

Choose The Modulation Type 16PSK ▼

CALCULATE

Power Transmitted in dB: 39.40 dB
Power Transmitted in dBm: 69.40 dBm
Power Transmitted (unitless): 8709.64

Scenario 2: BPSK/QPSK & All Values In dBs & Approximation for BER Test Case

The screenshot shows a mobile application interface for calculating power transmitted. The app is titled "Power Transmitted Calculator". It features a list of 15 dB values: 150, 190, 7, 1, 43, 15, 22, 9, 20, 8, 25, 10, and 2. Each value is followed by a "db" unit and a dropdown arrow. Below the list is a text input field containing "0.000012". Underneath the input field is a dropdown menu labeled "Choose The Modulation Type" with "BPSK/QPSK" selected. A blue "CALCULATE" button is positioned below the dropdown. At the bottom, a box displays the results: "Power Transmitted in dB: 33.10 dB", "Power Transmitted in dBm: 63.10 dBm", and "Power Transmitted (unitless): 2041.74".

| Value | Unit |
|-------|------|
| 150 | db |
| 190 | db |
| 7 | db |
| 1 | db |
| 43 | db |
| 15 | db |
| 22 | db |
| 9 | db |
| 20 | db |
| 8 | db |
| 25 | db |
| 10 | db |
| 2 | db |

0.000012

Choose The Modulation Type BPSK/QPSK

CALCULATE

Power Transmitted in dB: 33.10 dB
Power Transmitted in dBm: 63.10 dBm
Power Transmitted (unitless): 2041.74

Fourth Calculator

Validation

The image shows a mobile application interface for a "Network Throughput Calculator". The app has a light purple background. At the top, the title "Network Throughput Calculator" is centered. Below the title, there are four input fields with labels: "Data Transmission Bandwidth (Mbps):", "Pure ALOHA" (with a dropdown arrow), "Maximum Signal Propagation Delay (μsec):", "Frame Size (Kbits):", and "Frame Rate (Kfps):". A blue "CALCULATE" button is positioned below the input fields. Below the button is a large, empty rectangular box. At the bottom of the screen, a grey rounded rectangle contains the text "Please enter valid numbers". The status bar at the top of the phone screen shows the time as 1:00 and various icons.

Scenario 1: PURE ALOHA Test Case

The image shows a mobile application interface for a 'Network Throughput Calculator'. The app has a light purple background. At the top, the title 'Network Throughput Calculator' is centered. Below the title are four input fields with horizontal lines, containing the values 20, 40, 10, and 5000. A dropdown menu is positioned between the first and second input fields, showing 'Pure ALOHA'. Below the input fields is a blue button with the text 'CALCULATE'. At the bottom, there is a white box with a blue border containing the results: 'Results:', 'Protocol Type: Pure ALOHA', and 'Throughput: 1.68%'. The app is displayed on a black smartphone frame.

| Input | Value |
|-------|-------|
| S | 20 |
| P | 40 |
| T | 10 |
| R | 5000 |

Results:
Protocol Type: Pure ALOHA
Throughput: 1.68%

Scenario 2: SLOTTED ALOHA Test Case

The screenshot shows a mobile application interface for calculating network throughput. The title is "Network Throughput Calculator". There are four input fields with the values 20, 40, 10, and 5000. A dropdown menu is set to "Slotted ALOHA". A blue "CALCULATE" button is centered below the inputs. A results box at the bottom displays the following information:

| Results: |
|------------------------------|
| Protocol Type: Slotted ALOHA |
| Throughput: 20.52% |

Scenario 3: Unslotted Nonpersistent CSMA Test Case

The screenshot displays a mobile application interface for calculating network throughput. The title is "Network Throughput Calculator". The interface includes several input fields with the following values: 20, 40, 10, 5, and a dropdown menu set to "Unslotted Nonpersistent CSMA". A blue "CALCULATE" button is positioned below the inputs. The results section, outlined in blue, shows: "Results: Protocol Type: Unslotted Nonpersistent CSMA Throughput: 67.22%".

| Input Field | Value |
|---------------|------------------------------|
| Field 1 | 20 |
| Field 2 | 40 |
| Field 3 | 10 |
| Field 4 | 5 |
| Protocol Type | Unslotted Nonpersistent CSMA |

| Results |
|---|
| Protocol Type: Unslotted Nonpersistent CSMA |
| Throughput: 67.22% |

Fifth Calculator

Validation

Cellular System Designer

Enter Number of Time Slots/Carrier:

Enter Total Area (meter squared): mili

Enter Number of Subscribers:

Enter Number of Calls/Day:

Enter Duration/Call: sec..

Enter Probability of Call Drop (e.g, 0.02):

Enter Min SIR: db

Enter Refrence Distance (meter): mili

Enter Power at The Reference Distance: db

Enter Path Loss Exponent:

Enter Receiver Sensitivity (Watt): mili

Enter No. of Co-Channel interfering sites (NB):

Design

Please enter valid numbers

Scenario 1: Typical GOS Value Test Case

Cellular System Designer

8

4 Me.. ▾

80000

8

3 min.. ▾

0.02

13 db ▾

10000 mili ▾

-22 db ▾

3

7 mic.. ▾

6|

Design

Results:
Maximum Distance: 96.60 meters
Maximum Cell Size: 24243.01 square meters
Number of Cells: 165.00
Traffic Load (Total): 1333.33 Erlangs
Traffic Load (Per Cell): 8.08 Erlangs
Channels Per Cell: 14
Carriers Per Cell: 2
Number of Cells Per Cluster: 9.00 (using i=0, j=3)
Total Carriers: 18.00

Scenario 2: GOS Approximation Test Case

The screenshot shows a mobile application titled "Cellular System Designer". It features several input fields with numerical values and dropdown menus for units. The values entered are: 8, 4, 80000, 8, 3, 0.38, 13, 10000, -22, 3, 7, and 6. The units shown are Me., min., db, mili, db, and mic.. A blue "Design" button is located below the inputs. At the bottom, a box displays the results of the calculation.

Cellular System Designer

8

4 Me..

80000

8

3 min..

0.38

13 db

10000 mili

-22 db

3

7 mic..

6

Design

Results:
Maximum Distance: 96.60 meters
Maximum Cell Size: 24243.01 square meters
Number of Cells: 165.00
Traffic Load (Total): 1333.33 Erlangs
Traffic Load (Per Cell): 8.08 Erlangs
Channels Per Cell: 6
Carriers Per Cell: 1
Number of Cells Per Cluster: 9.00 (using i=0, j=3)
Total Carriers: 9.00

Scenario 3: No. Of Channels/Trunks Upper Bound Test Case

Supports up to 117 channels/cell and 893,900 subscribers in the below design:

The screenshot shows a mobile application titled "Cellular System Designer". It features a series of input fields with numerical values and dropdown menus for units. The values entered are: 8, 4, 893900, 8, 3, 0.001, 13, 10000, -22, 3, 7, and 6. A blue "Design" button is located below the inputs. At the bottom, a box displays the results of the design.

| Input | Unit |
|--------|-------|
| 8 | |
| 4 | Me.. |
| 893900 | |
| 8 | |
| 3 | min.. |
| 0.001 | |
| 13 | db |
| 10000 | mili |
| -22 | db |
| 3 | |
| 7 | mic.. |
| 6 | |

Design

Results:
Maximum Distance: 96.60 meters
Maximum Cell Size: 24243.01 square meters
Number of Cells: 165.00
Traffic Load (Total): 14898.33 Erlangs
Traffic Load (Per Cell): 90.30 Erlangs
Channels Per Cell: 117
Carriers Per Cell: 15
Number of Cells Per Cluster: 9.00 (using i=0, j=3)
Total Carriers: 135.00