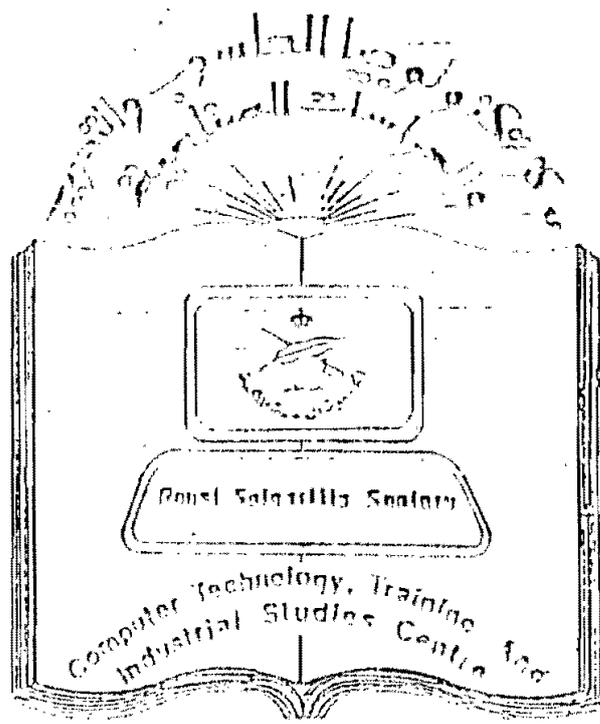
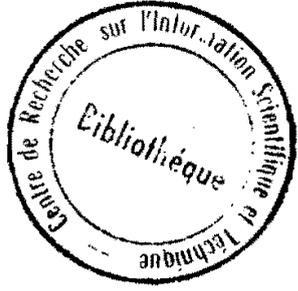


# SYSTEM PERFORMANCE



25 2026



CONTENTS

Page

1. QUEUING THEORY

1. INTRODUCTION ..... 1

1.1 What is a Queue? ..... 1

1.1.1 Queues in daily life ..... 1

1.1.2 Effects of queues ..... 2

1.1.3 Queuing theory ..... 8

1.2 On-line System and Queues ..... 12

2. QUEUING MODELS ..... 14

2.1 Model Components ..... 14

2.2 Input Source ..... 19

2.2.1 Size of population ..... 19

2.2.2 Arrival distribution ..... 20

2.3 Queue ..... 26

2.3.1 Size of queuing place ..... 26

2.3.2 Queuing arrangement ..... 29

2.4 Server ..... 30

2.4.1 Service order ..... 30

Quiz 1 ..... 35

2.4.2 Number of servers ..... 36

2.4.3 Service time ..... 38

Quiz 2 ..... 42

2.5 Standard Model and Kendall Symbols ..... 44

Quiz 3 ..... 46

2.6 Traffic Density and Server Utilization Rate ..... 48

2.6.1 Traffic density ..... 49

Quiz 4 ..... 53

2.6.2 Server utilization rate ..... 50

Quiz 5 ..... 51

BIBLIOTHEQUE DU CERIST

|   | Page |
|---|------|
| 3. SINGLE SERVER SERVICE QUEUING .....                  | 52   |
| 3.1 Single Server Service Model .....                   | 52   |
| 3.2 Theorem of Single Server Service .....              | 54   |
| 3.3 Average Waiting Time of Single Server Service ..... | 56   |
| Quiz 6 .....  | 60   |
| Quiz 7 .....  | 60   |

|   |     |
|---|-----|
| II. SYSTEM RESPONSE TIME CALCULATION  |     |
| 1. INTRODUCTION .....   | 65  |
| 2. PURPOSE OF PROCESSING PERFORMANCE CALCULATION AND<br>CALCULATION BASIS ..... | 66  |
| 2.1 Purpose of Processing Performance Calculation .....                         | 66  |
| (1) System design and processing performance calculation .....                  | 66  |
| (2) Hardware configuration and processing performance<br>calculation .....      | 67  |
| (3) Processing method and processing performance calculation ...                | 70  |
| (4) Bottle-neck at high traffic point .....                                     | 72  |
| (5) Operation during failure .....  | 76  |
| 2.2 Basic Data and Criteria in Processing Performance<br>Calculation .....      | 78  |
| 2.2.1 Basic Data .....  | 79  |
| (1) Processing objective transaction type .....                                 | 80  |
| (2) At which point is the traffic volume dealt with? .....                      | 80  |
| (3) Message length .....  | 82  |
| (4) Processing method .....   | 82  |
| (5) Hardware configuration .....  | 83  |
| 2.2.2 Criteria .....  | 86  |
| 3. DELAY TABLE .....  | 88  |
| 3.1 What is the Delay Table? .....  | 88  |
| 3.2 How to Use the Delay Table .....  | 90  |
| 3.3 Example of Delay Table Usage .....  | 92  |
| Quiz 1 .....  | 100 |
| 4. SYSTEM RESPONSE TIME CALCULATION .....                                       | 102 |
| 4.1 System Response Time Calculation Flow .....                                 | 102 |
| 4.2 Conditions for Examples .....   | 110 |
| 4.3 DASD Processing Time .....  | 116 |
| Quiz 2 .....  | 128 |

|  | Page |
|--|------|
| 4.4 CPU Processing Time .....  | 130  |
| Quiz 3 .....   | 140  |
| 4.5 Center Response Time .....   | 142  |
| Quiz 4 .....   | 148  |
| 4.6 Transmission Time .....  | 150  |
| Quiz 5 .....   | 160  |
| 4.7 System Response Time .....   | 162  |
| <br>   |      |
| 5. DETECTING AND ELIMINATING BOTTLE-NECKS .....                          | 164  |
| 5.1 Procedure for Improving System Response Time .....                   | 164  |
| 5.2 Average Processing Time and Resource Utilization Rate<br>Check ..... | 168  |
| 5.3 Detecting Bottle-necks .....   | 170  |
| 5.4 Tuning .....   | 174  |
| 5.4.1 Change in System Configuration .....                               | 174  |
| 5.4.2 Adding of Devices .....  | 176  |
| 5.4.3 Replacing of Devices .....   | 178  |

|  |     |
|--|-----|
| III. SYSTEM EVALUATION OUTLINE                           |     |
| 1. INTRODUCTION .....                                    | 181 |
| 1.1 System Evaluation Flow .....                         | 184 |
| 1.2 System Evaluation of the System Being Operated ..... | 188 |
| 2. SYSTEM EVALUATION METHOD .....                        | 192 |
| 2.1 Service Target Value Setting .....                   | 194 |
| 2.2 Operation Data Collection .....                      | 196 |
| 2.2.1 Cycle of Data Collection .....                     | 196 |
| 2.2.2 Monitor .....                                      | 200 |
| (1) Software monitor and hardware monitor .....          | 200 |
| (2) Logging data .....                                   | 208 |
| (3) Software monitor .....                               | 214 |
| (4) SMF and PDL/PDA .....                                | 216 |
| 2.3 Performance Analysis and Evaluation .....            | 220 |
| 2.4 Measures .....                                       | 224 |
| 3. IMPROVING PERFORMANCE .....                           | 230 |
| 3.1 CPU Utilization Rate .....                           | 230 |
| 3.2 Improving I/O Utilization Rate .....                 | 234 |
| 3.3 Improving Memory Utilization Rate .....              | 238 |