



**Bahria University**  
Discovering Knowledge

**BAHRIA UNIVERSITY,  
(Karachi Campus)**

*Department of Software Engineering*

**ASSIGNMENT #. 02 – Spring 2022**

COURSE TITLE: **Operating Systems**

Class: **BSE - 4(A & B)**

Course Instructor: **Engr. Rizwan Fazal**

Due Date: **30-May-2022 (4pm)**

COURSE CODE: **CSC-320**

Shift: **Morning**

Date: **16-May-2022**

Max. Marks: **10 Points**

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**ASSIGNMENT #. 2**

**Submitted by:**

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Registration #: **70003**

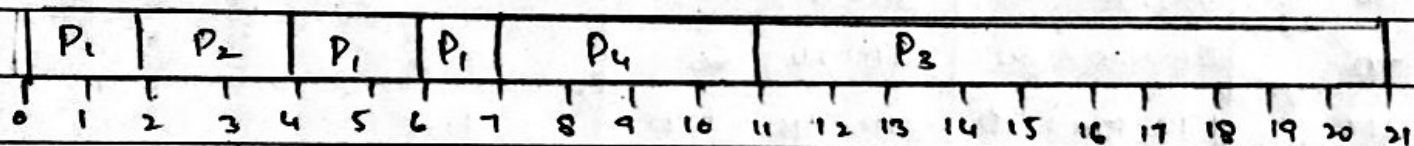
Section: **BSE-4B**

# Problem 9.1)

Process	Service	Arrival	Priority
$P_1$	50	0	4
$P_2$	20	20	1
$P_3$	100	40	3
$P_4$	40	60	2

note : all times are in ms  
for diagrams, 10 ms = 1 unit.

a) SRT:



Remaining times at  $P_1$ 's arrival:  
 $P_1 = 50$

at  $P_2$ 's arrival:  
 $P_1 = 30$ ,  $P_2 = 20$

at  $P_3$ 's arrival:  
 $P_1 = 30$ ,  $P_3 = 100$

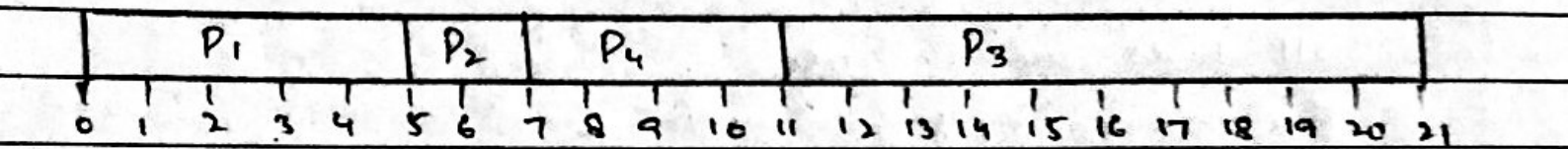
at  $P_4$ 's arrival:  
 $P_1 = 10$ ,  $P_3 = 100$ ,  $P_4 = 40$

at  $P_1$ 's completion:  
 $P_3 = 100$ ,  $P_4 = 40$

at  $P_4$ 's completion:  
 $P_3 = 100$

Finish	Wait ( $t_{at} - \text{service}$ )	Turnaround ( $t_{finish} - \text{arrival}$ )	Normalized $t_{at}$ ( $t_{at} / \text{service time}$ )
70	$70 - 50 = 20$	$70 - 0 = 70$	1.4
40	$20 - 20 = 0$	$40 - 20 = 20$	1
210	$170 - 100 = 70$	$210 - 40 = 170$	1.7
110	$50 - 40 = 10$	$110 - 60 = 50$	1.25

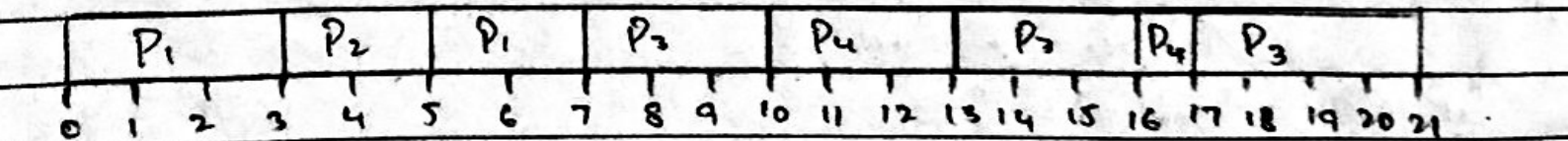
Non-preemptive Priority:



Finish	Wait	Turnaround	Normalized $t_{at}$
50	$50 - 50 = 0$	$50 - 0 = 50$	1
70	$50 - 20 = 30$	$70 - 20 = 50$	2.5
210	$170 - 100 = 70$	$210 - 40 = 170$	1.7
110	$50 - 40 = 10$	$110 - 60 = 50$	1.25

Round Robin :

Time quantum = 30 ms.



Queue :  $P_1$   $P_2$   $P_1$   $P_3$   $P_4$   $P_3$   $P_4$   $P_3$

$P_1$  50 20 0

$P_2$  20 0

$P_3$  100 70 40 0

$P_4$  40 10 0

Finish	Wait	Turnaround	Normalized Lat
70	$70 - 50 = 20$	$70 - 0 = 70$	1.4
50	$30 - 20 = 10$	$50 - 20 = 30$	1.5
210	$170 - 100 = 70$	$210 - 40 = 170$	1.7
170	$110 - 40 = 70$	$170 - 60 = 110$	2.75

b) Average waiting times:

$$SRT = \frac{20 + 0 + 70 + 10}{4} = 25 \text{ ms}$$

$$Priority = \frac{0 + 30 + 70 + 10}{4} = 27.5 \text{ ms}$$

$$Round Robin = \frac{20 + 10 + 70 + 70}{4} = 42.5 \text{ ms}$$



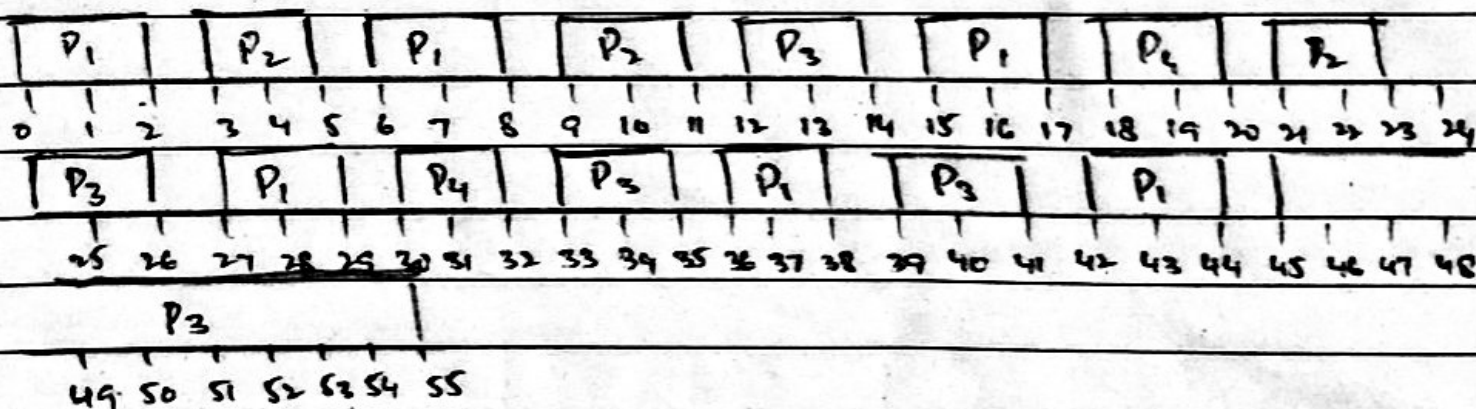
## Problem 9.2)

The factors that should be considered in determining the time quantum in round robin are as follows;

- Throughput
- Turnaround Time
- Waiting Time

Process	Arrival	Service
$P_1$	0	12
$P_2$	2	6
$P_3$	8	18
$P_4$	10	4

For  $q_1 = 2$  :



Queue :  $P_1 P_2 P_1 P_2 P_3 P_1 P_4 P_2 P_3 P_1 P_4 P_3 P_1$   
 $P_2 P_1 P_3$

$P_1$  12 16 8 6 4 2 0

$P_2$  6 4 2 0

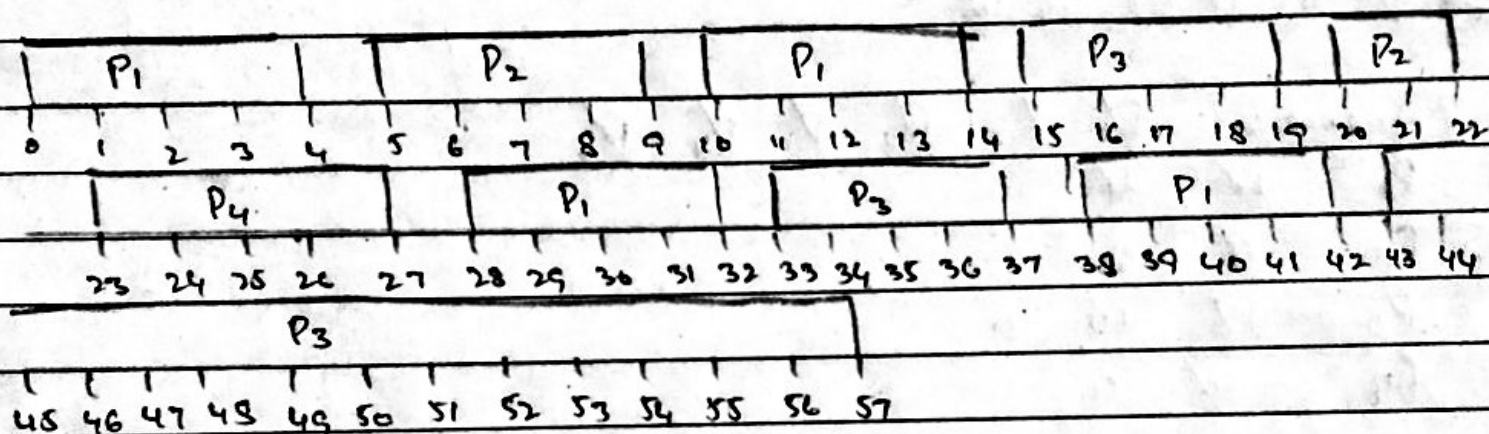
$P_3$  18 16 14 12 10 8 6 4 2 0

$P_4$  4 2 0

Finish	Arrival	Turn around.
44	0	44
23	2	21
55	8	47
32	10	22

$$\text{mean} = \frac{134}{4} = \boxed{33.5}$$

For  $q_1 = 4\%$



Queue:  $P_1$   $P_2$   $P_1$   $P_3$   $P_2$   $P_4$   $P_1$   $P_3$   $P_1$   $P_3$

$P_1$  17 8 4 0

$P_2$  6 2 0

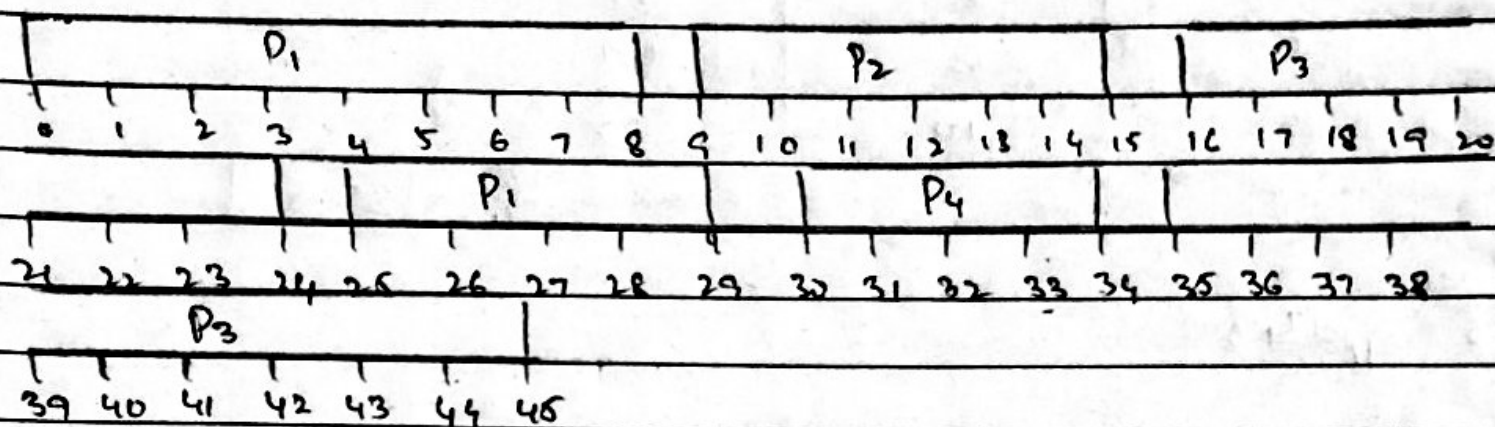
$P_3$  18 14 0

$P_4$  4 0

Finish	Arrival	Turnaround
42	0	42
22	2	20
57	8	49
27	10	17

$$\text{mean} = \frac{128}{4} = \boxed{32}$$

For  $q_1 = 8$ :



Queue:  $P_1$   $P_2$   $P_3$   $P_4$   $P_5$

$P_1$  17 4 0

$P_2$  6 0

$P_3$  18 16 0

$P_4$  4 0

Finish	Arrival	Turnaround
29	0	29
15	2	13
45	8	37
34	10	24

$$\text{mean} = \frac{103}{4} = \boxed{25.75}$$