



***"Investing in Africa's Future"***

**COLLEGE ENGINEERING AND APPLIED SCIENCES**

**NCSC 211- OPERATING SYSTEMS**

**END OF SECOND SEMESTER EXAMINATIONS**

**APRIL 2025**

**LECTURER: Mrs L FUNDISI**

**DURATION: 3 HOURS**

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### ***INSTRUCTIONS***

Answer **any 4 (four)** questions

All questions carry equal marks (25)

Show working!

Smart presentation of all answers will earn you extra marks

Begin your answer to each question on a fresh page

## Question One

- a) Briefly explain the following schedulers: Long term, short term and medium term [12marks]
- b) With the aid of a diagram outline and explain the '*process state*'. [13 marks]

## Question Two

- a) Consider the following system snapshot using data structures in the Banker's algorithm, with resources A, B, C, and D, and processes P1 to P5:

|    | MAXIMUM |   |   |   | ALLOCATION |   |   |   | NEED |   |   |   | AVAILABILITY |   |   |   |
|----|---------|---|---|---|------------|---|---|---|------|---|---|---|--------------|---|---|---|
|    | A       | B | C | D | A          | B | C | D | A    | B | C | D | A            | B | C | D |
| P0 | 6       | 0 | 1 | 2 | 4          | 0 | 0 | 1 |      |   |   |   | 3            | 2 | 1 | 2 |
| P1 | 2       | 7 | 5 | 0 | 1          | 1 | 0 | 0 |      |   |   |   |              |   |   |   |
| P2 | 2       | 3 | 5 | 6 | 1          | 2 | 5 | 4 |      |   |   |   |              |   |   |   |
| P3 | 1       | 6 | 5 | 3 | 0          | 6 | 3 | 3 |      |   |   |   |              |   |   |   |
| P4 | 1       | 6 | 5 | 6 | 0          | 2 | 1 | 2 |      |   |   |   |              |   |   |   |

Using Banker's algorithm, answer the following questions.

- a) How many resources of type A, B, C, and D are there? [3 marks]
- b) What are the contents of the Need matrix? [4 marks]
- c) With a clear indication of the safe sequence, is the system in a safe state? Why, (show working). [13 marks]
- d) **New request made**                      **1      6      0      5**

Using Banker's algorithm, determine if the projected allocation state is safe and whether the request will be granted or not. [5 marks]

### Question Three

Using examples, explain the following in process synchronization problems and their solutions

- Dining philosophers problem
  - Critical section problem
  - Cigarette smoker's problem
  - Bounded buffer problem
  - The sleeping barber problem
- [25 marks]

#### Question Four

Table below shows a set of processes and the associated burst time

| Process | Burst time |
|---------|------------|
| P1      | 21         |
| P2      | 46         |
| P3      | 12         |
| P4      | 37         |
| P5      | 40         |
| P6      | 56         |
| P7      | 75         |

- Compute the average waiting time for this algorithm used. Show the total waiting time with a quantum of 20. [10 marks]
- Describe the condition for deadlock and four strategies of dealing with deadlock. [15 marks]

#### Question Five

| Process ID | Arrival Time | Burst Time |
|------------|--------------|------------|
| P0         | 0            | 8          |
| P1         | 1            | 1          |
| P2         | 2            | 3          |
| P3         | 3            | 2          |
| P4         | 4            | 6          |

Pre-emptively and non pre-emptively compute the **competition time, average turn around time and average waiting time** for the above processes that are executing using Shortest job first algorithm (show working). [25 marks]

#### Question Six

- Differentiate the following:
  - Compile time vs load time
  - Logical address vs physical address
  - Internal fragmentations vs external fragmentation. [9 marks]
- Given 7 memory partitions of 100Kb, 500Kb, 200Kb, 300Kb, 600Kb, 400Kb, 250Kb(in order), how would the first-fit, best-fit, and worst-fit algorithms place

processes of 100 Kb, 318 Kb, 212 Kb, and 515 Kb , 50Kb, 495Kb (in order)?  
Which algorithm makes the most efficient use of memory and why? Explain the  
solution to the left memory? [16 marks]

**END OF EXAMINATION**