Duration: 50 minutes

Write your name and course on each answer sheet.   Total: **60** marks
Answer all questions.

1. User → kernel: The application open and load files into buffer.
    Kernel → User: All files have been loaded into buffer.
    User → Kernel: The program writes output files to storage.
    Kernel → User: All files have been written to storage.

2.
    a) New → Ready → Running → Blocked → Blocked/Suspend → Ready/Suspend → Ready →
        Running → Blocked → Exit

    b) When T1 waits for input from scanner, it will be blocked instead of the process.
        The process and T2 may continue to execute while T1 is blocked.

3. Thread switching will **interleave** the execution of the instructions and **different sequence** of
    execution yields to **different result of k**.
    A1 – A2 – B1 – B2: x = 9, k = 0
    A1 – B1 – B2 – A2: x = 9, k = 1

4.

Arrival		B		D	A			E											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
HRRN	C	C	C	C	B	B	B	B	B	B	D	D	D	A	A	A	E	E	E	E
RR, q=2	C	C	B	B	C	C	D	D	B	B	A	A	E	E	D	B	B	A	E	E

5. P(2) will be blocked by the wait operation on semaphore n.
    P(1) will be blocked by the wait operation on semaphore a. Thus, deadlock occurs.

6.  ```
    semaphore semgo = 0, load = 0, clear = 1;

    Loader(){
        wait(semgo);
        wait(clear);
        //loading item
        signal(load);
    }

    Launcher(){
        wait(load);
        //launching item
        signal(clear);
    }
    ```