

**ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)**  
**ORGANISATION OF ISLAMIC COOPERATION (OIC)**

**Department of Computer Science and Engineering (CSE)**

**MID SEMESTER EXAMINATION**

**WINTER SEMESTER, 2018-2019**

**DURATION: 1 Hour 30 Minutes**

**FULL MARKS: 75**

**CSE 4501: Operating Systems**

Programmable calculators are not allowed. Do not write anything on the question paper.

There are **4 (four)** questions. Answer any **3 (three)** of them.

Figures in the right margin indicate marks.

1.
  - a) What is an operating system? Write down the services provided by the operating systems. 5
  - b) Explain with example how UNIX creates a new process using system calls *fork* and *exec*. 7
  - c) What could happen if applications were allowed to jump into kernel mode at any location in the kernel? Explain how the operating system control the entry of application to kernel at specific location. 7
  - d) Explain how can the base and bound registers prevent users from accessing other users' programs data. 6
2.
  - a) Explain the necessity of using two stacks for each process. 5
  - b) Explain the steps that an operating system goes through when the CPU receives an interrupt. 8
  - c) When a user process is interrupted or causes a processor exception, the x86 hardware switches the stack pointer to a kernel stack, before saving the current process state. Explain why. 6
  - d) When the CPU receives an interrupt, how does it determine what instruction to execute next? 6
3. Consider the following set of tasks to be scheduled for execution on a single CPU system. Note that a lower number represents a higher priority.

Task	Arrival Time	Service Time(ms)	Priority
$T_1$	0	10	2
$T_2$	2	8	1
$T_3$	3	3	3
$T_4$	10	4	2
$T_5$	12	1	3
$T_6$	15	4	1

- a) Draw a Gantt chart showing FCFS scheduling for these tasks. 5
- b) Draw a Gantt chart showing SJF (non-preemptive) scheduling. 5
- c) Draw a Gantt chart showing preemptive priority scheduling. 5
- d) Draw a Gantt chart showing round robin scheduling with time quantum 2 ms. 5
- e) Find the scheduling policy with the minimum average waiting time. Also, mention the average waiting time of that scheduler. 5

4. a) Differentiate process and thread. Explain, with specific example(s), the advantages of using threads. 8
- b) Explain the steps involved in creating a thread. 5
- c) Define the state of a thread and the set of data used to represent the state of a thread (i.e., the per-thread state). 4
- d) When a process cycles through different states in its life time, the TCB and the values associated with its states change location. For example, when a process is just created, its TCB is attached to the "New List" and the TCB contains the values associated with its state. Write down the location of the TCB and the state of a thread when it is in the RUNNING, WAITING and READY states. 8