



FreeExams.co.ke

**UNIVERSITY EXAMINATIONS  
2022/2023 ACADEMIC YEAR**

**SUPPLEMENTARY/SPECIAL EXAMINATIONS  
THIRD YEAR SEMESTER ONE EXAMINATIONS**

**FOR THE DEGREE OF  
BACHELOR OF SCIENCE  
(COMPUTER SCIENCE)**

**COURSE CODE : CSC 371E  
COURSE TITLE : REAL TIME SYSTEMS**

**DATE: 02/08/2023**

**TIME: 8.00AM-10.00AM**

---

**INSTRUCTIONS TO CANDIDATES**

**ANSWER QUESTIONS ONE AND ANY OTHER TWO.**

## SECTION ONE [COMPULSORY]

### Question #1 [30 Marks]

- a) Describe the following terms. [4Marks]  
i. Real-time  
ii. Hard real-time systems
- b) Discuss areas in which real-time systems are applied. [6Marks]
- c) Using a well labeled diagram, describe model of a typical real-time system. [8Marks]
- d) Elucidate characteristics of Real-Time Systems. [6Marks]
- e) What is the relationship between safety and reliability in Real-Time Systems? [2Marks]
- f) Reliability is a key requirement for Real-Time Systems; discuss how this can be achieved. [4Marks]

## SECTION TWO [ANSWER ANY TWO]

### Question #2 [20 Marks]

- a) Differentiate between Real-Time Tasks. [4Marks]  
i. Hard RTT and Firm RTT  
ii. Soft RTT & Non RTT
- b) Based on time, events in real-time systems can be classified in two main categories. Discuss these categories. [4Marks]
- c) Using examples, describe the following time constraints. [6Marks]  
i. Performance Constraint  
ii. Behavioural Constraint  
iii. Performance Delay Constraint
- d) Using a well labeled diagram, describe classifications of timing constraints. [6Marks]

### Question #3 [20 Marks]

- a) Differentiate the following terms as used in Real-Time Task Scheduling [4Marks]  
i. Relative deadline and Absolute deadline  
ii. Task Instance and Task Precedence
- b) Discuss classifications of Real-Time Tasks. [6Marks]
- c) Discuss the following categories of RTT scheduling algorithms. [6Marks]  
i. Clock Driven  
ii. Event Driven  
iii. Hybrid

- d) Describe relationship between Table Driven Scheduling and Cyclic Scheduler. [4Marks]

**Question #4 [20 Marks]**

- a) Define the following terms [4Marks]
- i. Serially reusable resource
  - ii. Non pre-emptable resource
- b) Explain how priority inheritance protocol works. [6Marks]
- c) Discuss how the following problems of PIP can be resolved. [6Marks]
- i. Deadlock
  - ii. Chain Blocking
- d) Describe the functioning of Priority Ceiling Protocol (PCP). [4Marks]

**Question #5 [20 Marks]**

- a) Define the following terms as used in RTS. [2Marks]
- i. Clock Synchronization
  - ii. Real-Time Operating System (RTOS)
- b) Describe the role of clock in RTS. [4Marks]
- c) Using well labeled diagram, discuss two approaches of clock synchronization in RTS. [8 Marks]
- d) Giving examples, explain key features of Real-Time Operating Systems. [6 Marks]