KABARAK UNIVERSITY

UNIVERSITY EXAMINATIONS

2010/2011 ACADEMIC YEAR

FOR THE DEGREE OF BACHELOR OF COMPUTER SCIENCE

COURSE CODE: COMP 453

COURSE TITLE: REAL TIME APPLICATIONS

STREAM: Y4S2

DAY: TUESDAY

TIME: 9.00 – 11.00 A.M.

DATE: 22/03/2011

INSTRUCTIONS:

1. **This question paper has four questions**
2. **QUESTION ONE IS COMPULSORY AND HAS 30 MARKS**
3. **Answer any other two questions worth 20 marks**

PLEASE TURN OVER

QUESTION ONE (30 marks)

(a) What is the role of actuators and sensors in real time systems? (2mks)

(b) Differentiate between static and dynamic scheduling. (2mks)

(c) Discuss the use of Petri net model for real time systems. (5mks)

(d) Explain any three reliability measures. (3mks)

(e) 'A system need not be fast and high performing to be considered real time system'. Explain. (3mks)

(f) What is fault tolerance? Give two ways of classifying fault tolerant systems. (5mks)

(g) What is deadlock? Give Coffman's conditions for deadlock (5mks)

(h) Explain exceptional conditions in real time system with examples (3mks)

(i) Differentiate between fault and failure in fault tolerant system. (2mks)

QUESTION TWO (20 marks)

(a) What is priority inversion? Explain using example of Mars Pathfinder giving all its tasks and their priorities. (5mks)

(b) Explain the three types of tasks. (3mks)

(c) A task is submitted to the system and it takes 5ms to start executing. It is required that it must finish its execution within 20ms otherwise the result will be useless. The task though takes half of its required time to finish its execution.

i. What type of RTS is it? (2mks)

ii. Determine its response time, execution time and relative deadline. (3mks)

(d) What is an analog signal? Explain steps to convert analog to digital signal. (4mks)

(e) List three ways of deadlock recovery (3mks)

QUESTION THREE (20 marks)

(a) What are the assumptions made while determining the schedulability of a task under EDF algorithm(Any four) (4mks)

(b) Explain the parameters used to measure QoS. What should be the nature of each of these in a quality system? (6mks)

(c) Explain Cyclic executive algorithm for Real time Scheduling (5mks)

(d) Explain any five design issues of real time system (5mks)

QUESTION FOUR (20 marks)

(a) Shown below is a table of 4 periodic processes scheduled using **RMA**. Determine if all the deadlines will be met using utilization factor (5mks)

Tasks	**Execution Time**	**Period = T**
T1	10	100
T2	30	150
T3	50	250
T4	100	500

(b) What is the use of a scheduler in real time system (2mks)

(c) Explain any four features of RTOS (4mks)

(d) A system is said to be have a reliability of 0.94 in 6 hours. What does it mean? (2mks)

(e) What major shortcoming in integrated service is overcome by differentiated service in QoS? (2mks)

(f) Differentiate between soft and firm real time giving examples in each (4mks)

(g)Explain the following (i) Context switching
(ii) Time overloading
(iii) Determinism (3mks)