University of KwaZulu-Natal Examinations (Main session) October 2016

School of Engineering (Computer Engineering)

Course and Code: **Real Time Computing – ENEL4RCH2**

Duration: **TWO** hours Maximum marks 100 Paper 1

Examiners: Prof A. Bagula (External)
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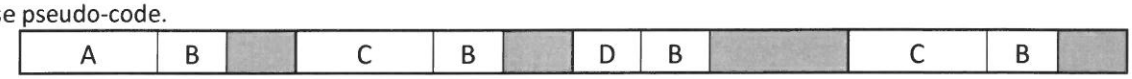
SECTION A (BASIC CONCEPTS)

1) What is the meaning of
   a. "Mutual exclusion" and "critical section" in a real time system? [5]
   b. "Task arrival" and "Despatch"? [5]

2) When do pre-emptive schedulers re-prioritise waiting tasks? Explain why. [10]

SECTION B (CYCLIC EXECUTIVES)

1) Consider the following schedule and write an interrupt driven, fully commented, energy-efficient CE for the schedule. Use pseudo-code. [10]



2) Design a cyclic executive to schedule A=(2, 8, 8), B=(1, 6, 6), C=(1, 4, 4) [20]

SECTION C (BASIC SCHEDULING)

1) Consider the following processes. [15]

Process	CPU time	Period	Deadline
A	10	50	35
B	15	100	20
C	20	200	200

   a. What is the difference in task prioritisation in DMA and RMA, and under what condition is RMA and DMA identical? [3]
   b. Using RMA, what priorities are assigned to the above tasks? Are they schedulable if they all arrive simultaneously? Draw a scheduling diagram that indicates if task deadlines are met. [6]
   c. Using DMA, what priorities are assigned to the above tasks? Are they schedulable if they all arrive simultaneously? Draw a scheduling diagram that indicates if task deadlines are met. [6]

2) Consider the set of tasks below:

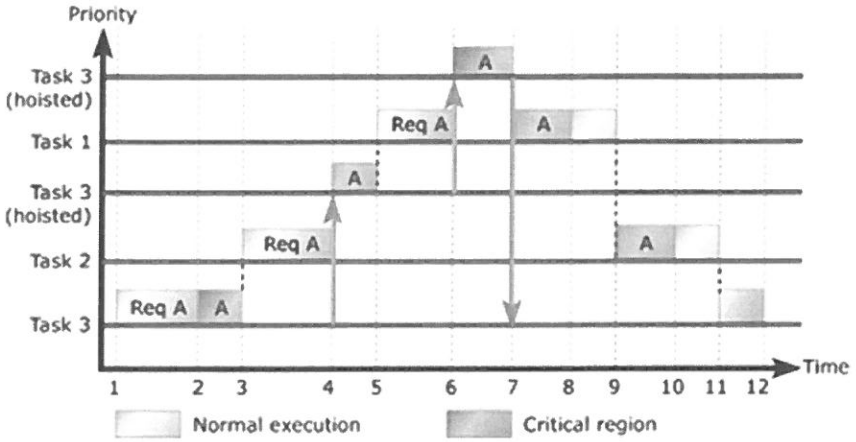
	C	P	D
T_1	1	8	8
T_2	2	5	5
T_3	4	10	10

   a. Show that the above are EDF schedulable. [2]
   b. Can EDF work without pre-emption? Explain. [3]
   c. Draw the schedule (assume all tasks arrive at T=0) and indicate pre-emption events. Show each process on a different line and show the combined schedule below. [5]

3) Every scheduler was developed to address a specific type of scheduling problem. Consider the earliest deadline first scheduler. What is its underlying principle, its strengths, weaknesses and application domain? [10]

SECTION D (PRIORITY INVERSION)

1) Using the diagram and table below explain, for each of the 12 steps, how PIP handles the three tasks that request one resource. [15]



Task	Priority
Task1	High
Task2	Medium
Task3	Low